

THE FORESTS OF INDIA

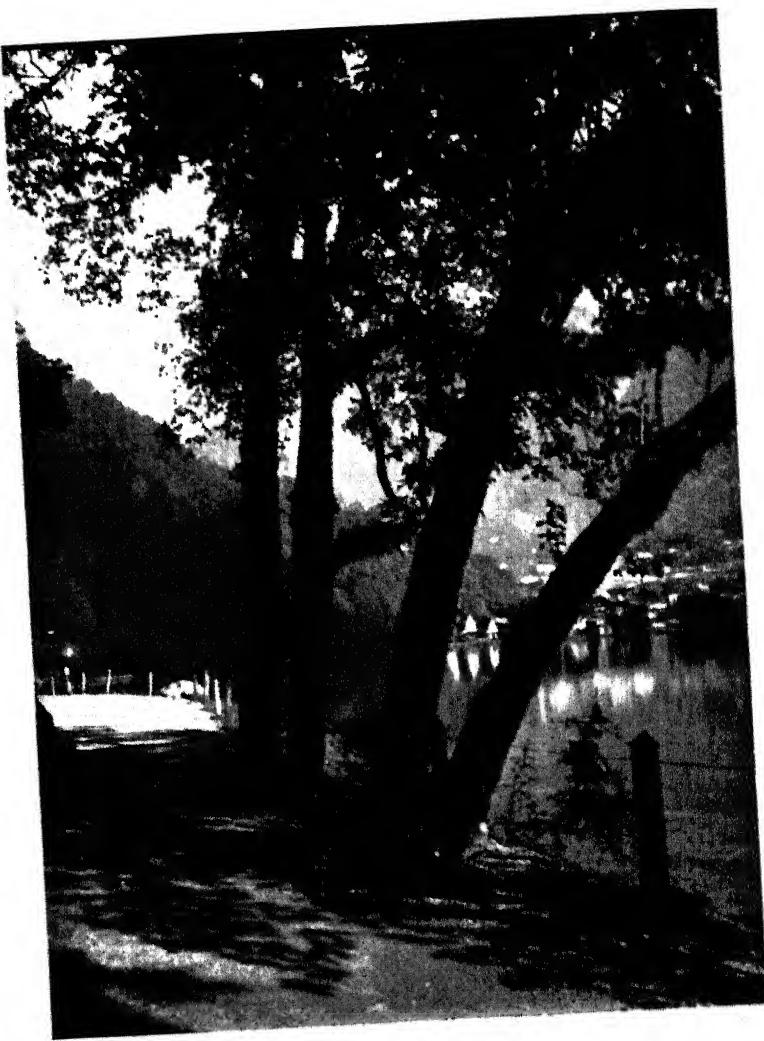
VOLUME I

BY THE SAME AUTHOR

THE DIARY OF A SPORTSMAN NATURALIST
IN INDIA
STALKS IN THE HIMALAYAS
JUNGLE BY-WAYS IN INDIA
AT THE SERBIAN FRONT IN MACEDONIA
FROM CZAR TO BOLSHEVIK

THE BODLEY HEAD

75285



THE LAKE AT NAINITAL, NESTLED IN A SECLUDED VALLEY UNDER THE
SUMMIT OF CHINA PAHKAR (7,070 FEET 4,000).

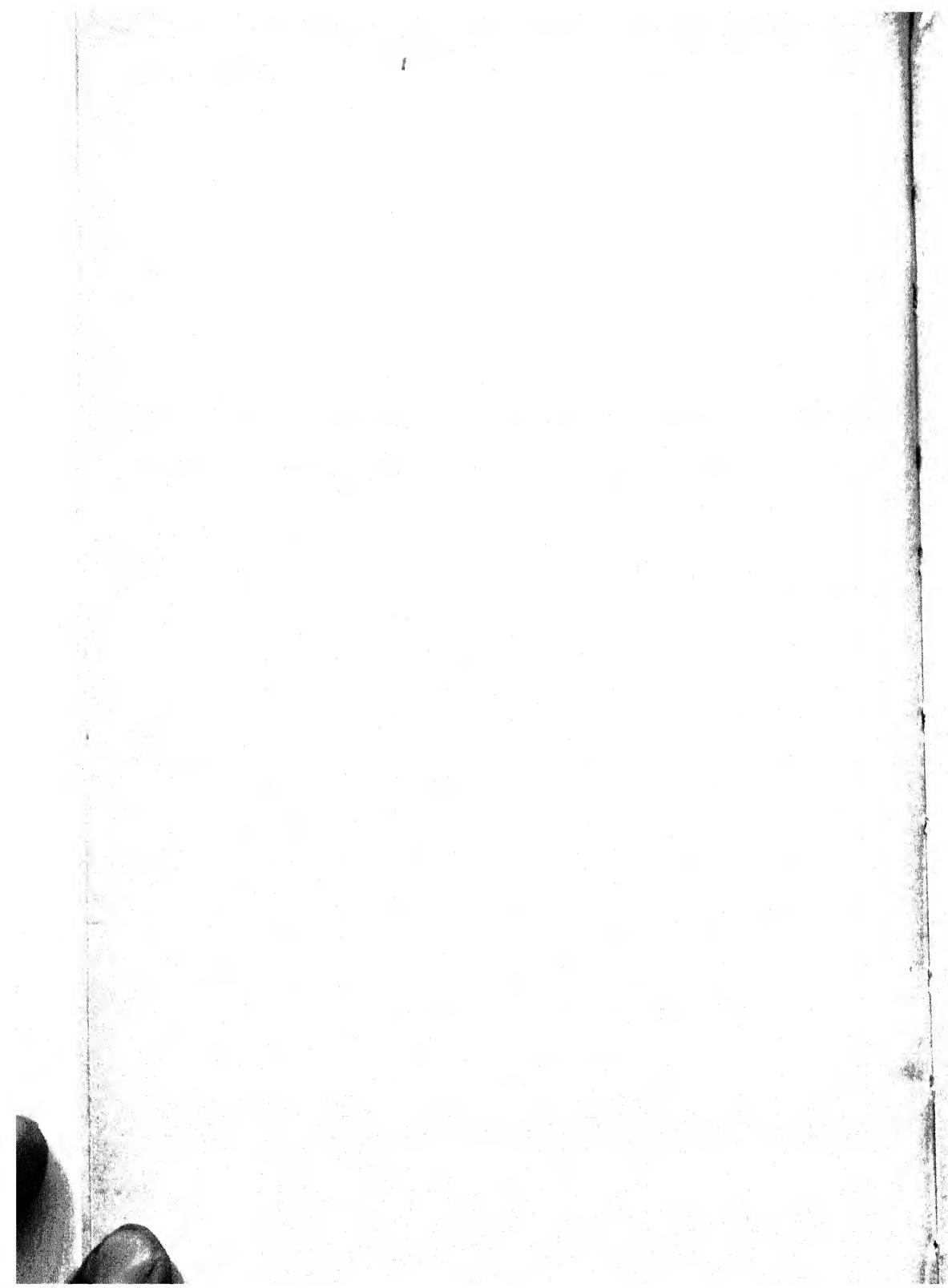
THE FORESTS OF
INDIA. BY E. P. STEBBING
M.A., LATE OF THE INDIAN FOREST
SERVICE, PROFESSOR OF FORESTRY
UNIVERSITY OF EDINBURGH, F.L.S.
F.R.G.S. WITH ILLUSTRATIONS FROM
PHOTOGRAPHS. IN TWO VOL. : VOL. I

JOHN LANE THE BODLEY HEAD LIMITED
LONDON MCMXXII

Printed in Great Britain at
The Mayflower Press, Plymouth. William Brendon & Son, Ltd.

ON a tout dit sur l'utilité de la forêt, bienfaisante à la terre et à l'humanité, gardienne de l'eau, réservoir inépuisable de forces, par qui s'établit l'équilibre du climat et se reconstitue le sol nourricier : c'est elle, les savants contemporains nous l'apprennent, qui restaure l'énergie utile dans un monde qui va sans cesse s'usant et se dégradant. L'existence de l'homme est si intimement liée à celle de la forêt que la disparition menaçante des forêts, signifierait, pour nos sociétés, l'irréversible déchéance, et, pour notre globe lui-même, la mort lente et sûre. Et cependant c'est un fait indéniable et douleuroux ; les réserves de notre globe s'épuisent ; nos vieilles futaies tombent sous la cognée du bûcheron, sans qu'on laisse au capital-bois le temps de se reconstituer.

Bernard Brunhes, Director de l'Observatoire du Puy-de-Dôme.



CONTENTS OF VOLUME I

PART I

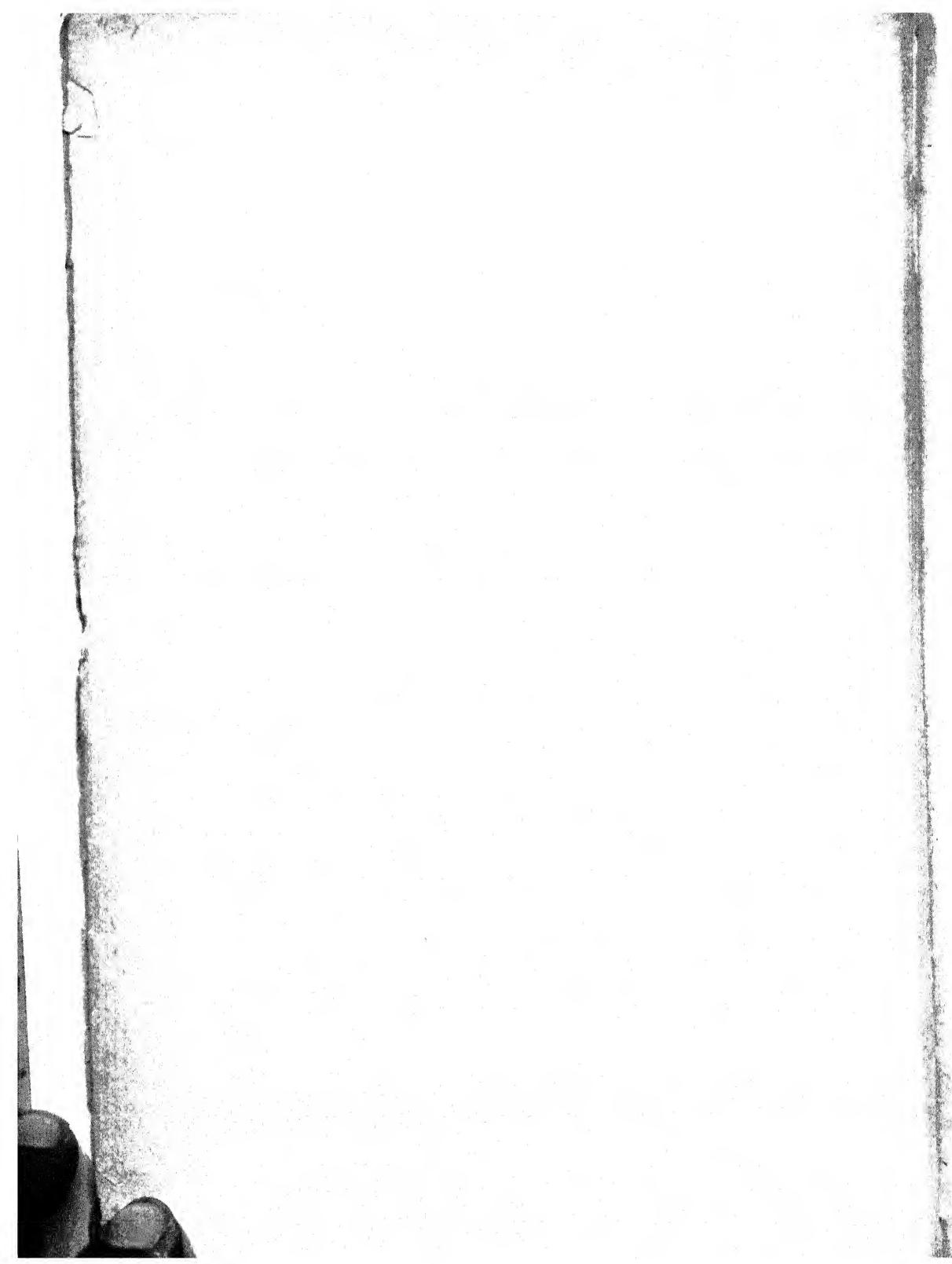
THE EARLY HISTORY OF THE FORESTS IN INDIA

CHAPTER	PAGE
I. GEOGRAPHICAL DESCRIPTION OF THE COUNTRY: ITS CLIMATE AND GEOLOGICAL FEATURES	3
II. THE EARLY HISTORY OF INDIA AND ITS INFLUENCE ON THE FORESTS	17
III. POSITION OF THE FORESTS AT THE TIME THE BRITISH ACHIEVED SUPREMACY IN INDIA	34
IV. ON THE CHARACTER AND DISTRIBUTION OF THE FORESTS.	39

PART II

THE POSITION AND TREATMENT OF THE FORESTS IN INDIA, 1796-1850

V. THE STAGES PRIOR TO THE DEVELOPMENT OF A FOREST POLICY, 1796-1850	61
VI. FOREST OPERATIONS IN THE MADRAS AND BOMBAY PRESI- DENCIES, 1796-1840	68
VII. FOREST OPERATIONS IN THE MADRAS AND BOMBAY PRESI- DENCIES (<i>continued</i>), 1840-50. THE CONOLLY TEAK PLANTATIONS	88
VIII. FOREST OPERATIONS IN TENASSERIM, BURMA—1796-1840 . .	125
IX. FOREST OPERATIONS IN TENASSERIM, BURMA (<i>continued</i>)— 1840-50	153
X. FOREST OPERATIONS IN UPPER INDIA—NORTH-WEST PRO- VINCES AND OUDH, CENTRAL INDIA, PUNJAB, BENGAL AND ASSAM, 1796-1850. THE FIRST MEETING OF THE BRITISH AND THE GURKHAS	191



INTRODUCTION

THIS History of the Forests of India and the growth of the Indian Forest Service has been written with the object of tracing the various stages through which the forests have passed during the development of the country under British rule. The aim kept in view has been to present to the Indian Forest Officer and the members of the other services in India who have a more or less direct or indirect connection with the forests, in detailed narrative form the progress of Forestry in the different Provinces of the country, and the steps by which that progress has been achieved. Ribbentrop's *Forestry in British India*, an invaluable work, has been the only account available to date. It was published in 1900. Personally I have felt the want, both during my service in India and since, of a work in somewhat greater detail and brought up to date.

The great difficulty experienced in dealing with the records available at the India Office and in India has been to make such a selection of material as would present a true picture of the various stages the forests of the country have passed through. My work has been greatly facilitated by the presence in the University of Edinburgh of the Cleghorn Library, Dr. Hugh Cleghorn, styled in a notification of the Government of India in 1865 as "The Father of Indian Forestry," having bequeathed his valuable collection of books and reports to the University.

The present volume of this History takes the reader up to the year 1864, when, with the appointment of Sir D. Brandis as the first Inspector-General of Forests in India, the Forest Service gradually came into being. The greater part of this period deals with the continued devastation of the forests

by timber merchants in order to supply the Government's requirements and by the people carrying on on the lines which had been in force for centuries ; but it will be shown that towards the end of the period a full realization of the value of the forest estate had been come to by the Secretary of State and the Government of India. It may be added that this recognition of the value of the forests was to no slight extent due to the work and warnings of a small number of officials chiefly of the Medical Service ; but also, in some notable instances, Civil and Military Members of the Civil and Political Services who at various times during the period in question had taken particular interest in the forests of the country.

Whilst engaged upon the History I have become impressed with the fact that this work will prove not only of value to India, but to the younger forestry services under the Colonial Office. Many of these are in the position with which India was faced half a century ago. Shifting cultivation is practised over extensive areas ; the firing of the forests and unchecked grazing are still rife ; methods of exploiting the forests by timber merchants or the local population are still far from being organised on up-to-date lines, and so forth. A study of how these practices were gradually checked and order brought into the forestry estate in the different Provinces throughout India (and the steps taken were by no means the same in each) should prove of considerable value to the Colonial Forest Services.

In addition to an index I have added a short glossary of the Indian words, made use of in old reports, etc., consulted, where quoted in the text.

I would wish to offer my thanks for the permission so kindly conceded me by the Secretary of State for India and the Government of India to make use of such records and reports as I required. My thanks are also due to the officials at the India Office, notably Mr William Foster, C.I.E., Registrar and Superintendent of Records, and to the officials in India who have kindly made accessible to me old records and returns. The illustrations call for special mention. It seemed

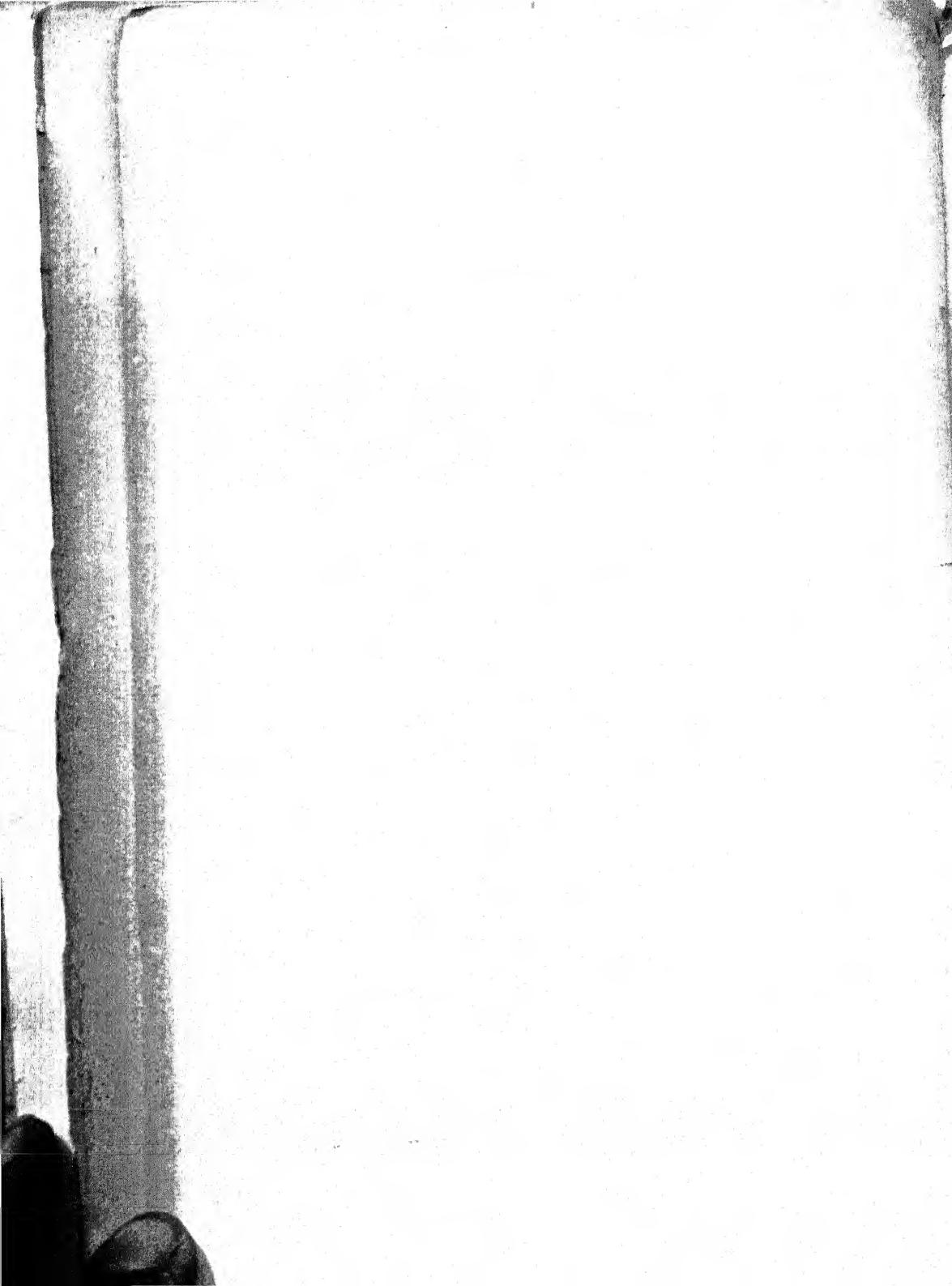
desirable that these should be as representative as possible of the period dealt with in this volume. To this end I have reproduced a few from Cleghorn's *Forests and Gardens of Southern India*. For others I am indebted to some old albums in the India Office Library. The illustration of Dr. Hooker is a reproduction of a portrait hanging on a wall at the India Office. Of the remainder a few are my own, and the rest are from the Collection at the Research Institute at Dehra Dun, kindly made available by Mr. W. F. Perree, C.I.E., President, with the permission of the Government of India.

Finally, I would also wish to thank my friend, Sir Sainthill Eardley Wilmot, K.C.I.E., who kindly read through the proofs, and Mr. J. S. Gamble, C.I.E., F.R.S., for information given me which facilitated my work.

E. P. STEBBING

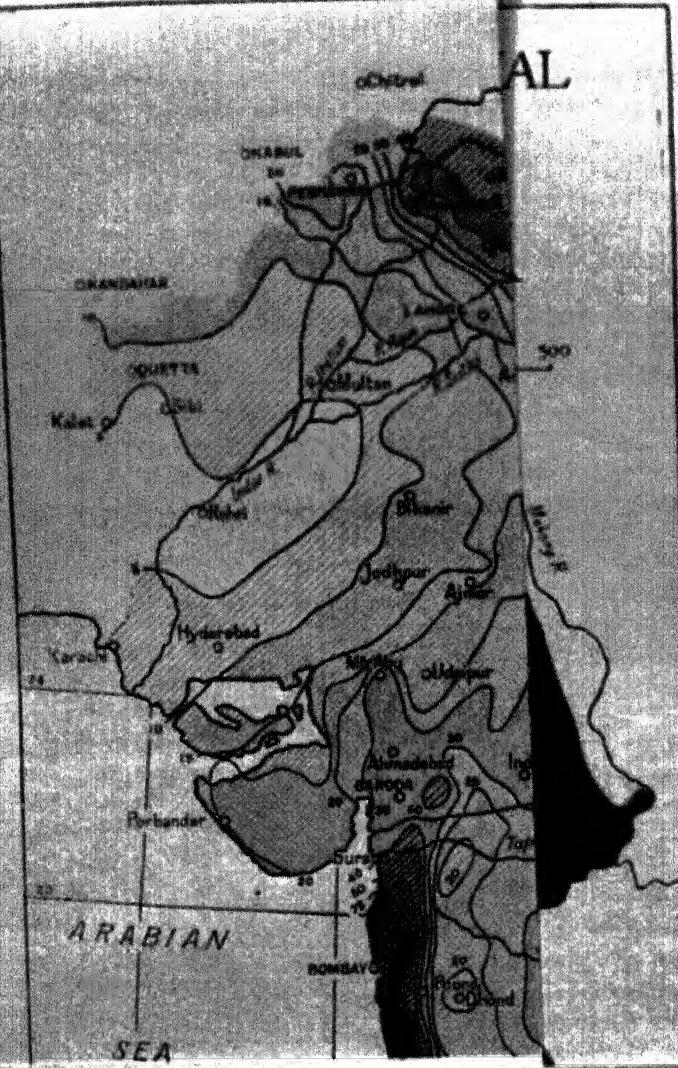
THE UNIVERSITY OF EDINBURGH

October, 1921



PART I

THE EARLY HISTORY OF THE FORESTS
IN INDIA



THE FORESTS OF INDIA

CHAPTER I

GEOGRAPHICAL DESCRIPTION OF THE COUNTRY : ITS CLIMATE AND GEOLOGICAL FEATURES

AS a preliminary to a consideration of the history of the Forests of India a brief summary of the geographical features of the country is necessary in order that the reasons for the great variations in the types of forest growth met with in different parts may be understood.

The shape of the Indian continent is usually considered to be triangular, with the Himalaya as the northern base and the sea on the other sides. Strictly speaking, however, " rhomboidal " more clearly defines the shape, a fact which was appreciated in ancient times by the great Greek geographer Strabo. The length of the north-eastern side of the rhomboid, from the head of the Bay of Bengal to the extreme north-west of Kashmir along the line of the Himalaya is about 1400 miles ; from Kashmir to Karachi on the north-western side is about 1200 miles ; Karachi to Cape Comorin running down the coast on the Arabian Sea on the south-west side of the rhomboid is 1750 miles ; and from Cape Comorin up the east coast of Madras to the mouths of the Hoogly River is another 1300 miles, washed by the Bay of Bengal. Strabo's measurements were as follows : from the sources of the Indus to the mouth of the Ganges, 16,000 stadia ; from the mouth of the Ganges to Cape Comorin, 16,000 ; from Cape Comorin to the mouth of the Indus, 19,000 ; from the mouth of the Indus to its source in the mountains, 13,000. If the stadium is taken as 115 of a mile, each of these measurements is only about

200 miles short of the actual length, which is a wonderful testimony to the accuracy of Greek research in ancient times.

The area comprised in this rhomboid omits Assam and Burma. An acute-angled triangle with a 300-mile base stretching up from the mouths of the Hoogly on the north-eastern side of the rhomboid and its apex situated 550 miles to the north-east will include Assam; and an attenuated triangle stretching southward and eastward for 1250 miles (all by rail) with its apex within two degrees of Cape Comorin and its base on the south-eastern side of the Assam triangle will roughly include the province of Burma.

The area of India is nearly 1½ million square miles. The following distances between some well-known points will give some idea of the size of the Continent. The distance from Bombay to Calcutta via Nagpur by railway is about 1200 miles. From Dehra Dun in the north, situated midway on the little plateau between the Himalaya and the Siwalik Range of hills, to Calcutta is 1000 miles; from Calcutta to Madras 1000 miles; and from Madras to Cape Comorin in the extreme southern extremity 500 miles. If we take a north and south line (as the crow flies) stretching from Kalka in the north, at the base of the Himalaya, from which the mountain railway ascends to Simla (about 70 miles), to Cape Comorin, and passing through Saugor and Hyderabad, the total length of the line is 1600 miles, the respective distances being, Kalka to Saugor 500 miles; Saugor to Hyderabad 450 miles; and Hyderabad to Cape Comorin 650 miles. From Umbala 40 miles to the south of Kalka, the distance by rail via Lahore to Attock in the extreme north-west is 430 miles.

It is the existence of the mighty mass of the Himalayan bulwark stretching across the north and blocking it off from Central Asia which has conserved to India its distinctive flora and fauna and has been a determining factor in the history of the country.

The following description of the physiography of India is from Holdich's *India, The Regions of the World Series*:

"To the north-east and north-west (the two northern sides of the rhomboid) are vast elevations of land surface from the foot of which the peninsula of India stretches away southwards in gradually ascending grades. To the north-east and north-west exist elevated regions of plateau and tableland buttressed by mountain systems which form the staircases

between the plains and the plateau. On the north-east the huge upheaval of Tibet rising to 16,000 feet above sea-level, shuts off the rest of Asia with an unpassable barrier of sterile and stony uplands bordered India-wards by a vast mountain region which comprises many complicated minor systems whose central peaks are the highest in the world. These are the Himalaya. From the western extremity of the central Tibetan upheaval, mountain ranges curving southwards determine the initial direction of the rivers of China, Siam, Burma and Assam, and round off the north-eastern borderland of India with a series of walls as impassable as the solid block of the Tibetan plateau. On the extreme north, abutting on the north-west of Kashmir, the Pamirs (well called the Roof of the World) flank the depression north of the Tibetan plateau westward, and mark the geographical centre from which spring the Kuen Lun, hedging in Tibet to the north ; the Himalaya dividing Tibet from India ; the Thian-shan, which are but the south-western links in the central orographical axis of Asia, which reaches north-east for 4600 miles to the Behring Straits, and the Hindu Kush, with its subsidiary ranges, forming the north-western barrier of India."

The importance of this north-western barrier will be alluded to in connection with the ancient history of India.

"To the south of the region of mountains is the region of depression which lies at its south-eastern foot, curving northward across the breadth of the peninsula from the Bay of Bengal (on the east) to the Arabian Sea (on the west), and including all the most fertile and densely populated districts of Hindustan. This is the great silt-formed land of India, the land of great rivers which flow through the Himalaya and the western mountains, bringing the soil of Tibet, of Afghanistan and Baluchistan to fertilise the land and nourish the swarming populations of Bengal, the United Provinces, the Punjab and Sind. In this area of depression (never rising more than a few hundred feet above sea-level and often only a few inches above) we must include Assam, the valley of the Brahmaputra. It may be noted here that all the three great river systems of India—the Indus, the Ganges and the Brahmaputra—derive a part of their water supply from sources which lie in the highlands beyond the Himalaya and the western mountains, and part from the countless valleys which lie hidden within the mountain folds."

To the south of the area of depression succeeds the region

outline fall back from the coast until they merge into the southern buttresses of the Nilgiris, leaving the broad plains of the Carnatic to stretch almost unbroken to the Bay of Bengal.

To the north of the line of the Western Ghâts, but thrown back at an angle which gives them a north-easterly and south-westerly trend, is an isolated range, flanking the eastern deserts of Rajputana and dividing them from the native states of Central India, called the Aravalli Range, the primeval range of India. Mount Abu (the highest point of the range) is 5000 feet above sea-level, an altitude which ensures a climate suitable for the small hill-station which occupies the highest slopes and clusters round the ancient rock-cut temples, overlooking vast stretches of plain to east and west. The Aravalli is but the most southern link of a system in which straight rocky ridges, more or less isolated by stretches of intervening sand, follow the same strike and crop up in parallel lines of small elevation through the length of Eastern Rajputana. In general appearance this formation is that of a range, connected and continuous, but which has been overwhelmed by an encroaching sand sea. The flood of sand has filled up its valleys, and drifted in long, smooth slopes against its crest until it has left nothing but lines of narrow, jagged peaks to mark its position. The Vindhya, the Aravalli Range, the Western Ghâts and the Nilgiris, with the final southern extension culminating in the Anaimalai Hills, are the chief mountain masses of the Indian Peninsula south of the Himalaya. Hidden amongst them are many spots of rare beauty, many a group of magnificent peaks clothed with an infinite variety of forest vegetation, the recesses of which are known but to the district official, the Forest Officer, or the sportsman."

The river systems of India may be grouped as follows:—

- (1) The Indus system on the north-west—Beas, Sutlej, Ravi, Jehlum, Chenab.
- (2) The Ganges and Brahmaputra on the north-east.
- (3) The Nerbuda, Tapti, Són and Mahanadi in the central group.
- (4) The Godavari, Kistna, Cauvery and others in the southern system.

The geographical features of Assam and Burma now require a brief description.

On the north the valley of Assam lies under the eastern

ridges of the Himalaya, which here comprise Bhután and the outlying border of Tibet, and include some of the most irreclaimable and uncivilised of Himalayan tribes. On the south the rough tableland of the Garo, Khasi and Jaintia Hills intervenes between the valley and the Cachar districts of Eastern Bengal drained by the Surma, ere the Surma joins the Brahmaputra after the latter has turned the western flank of the hills. Assam is the valley of the Brahmaputra, and it owes its wealth of agricultural resources—even its very existence—to that silt-bearing river. The Brahmaputra rises, like the Sutlej, near the sacred lake of Manasarawar. For 800 to 900 miles it flows steadily eastward through Tibet as the Tsan-pu, passing to the south of Lhasa, the Tibetan capital. Then, turning the eastern flank of the Himalaya, and receiving a few Chinese tributaries, it twists into Assam under the name of the Dihang. At this eastern bend it takes up the Dibang from the north and another stream (which is also named Brahmaputra) from the east, and finally, as the "Son of Brahma, the creator" (i.e. Brahmaputra), it proceeds to increase and fertilise the valley of Assam. Its drainage basin is 361,200 square miles, and its mean low-water discharge at Gualpara, near the head of the valley, amounts to 116,500 cubic feet per second. After receiving the Subansiri from Tibet the total flood discharge must be over 500,000 cubic feet.

"The Brahmaputra rolls down the Assam Valley in a vast sheet of water, broken by numerous islands, and exhibiting the operations of alluvion and deluvion on a gigantic scale." The vast quantity of silt brought from the Himalaya is deposited in banks at the smallest obstruction, and islands form and re-form in constant succession. Broad channels break away, and rejoin the main river after wide divergences which are subjected to no control. The swamps which closely adjoin the elevated alluvial foundation of the river bed are flooded in the rainy season till the lower reaches of the valley are one vast shining sea, from which the hills slope up on either side. After 450 miles of open course the river turns the western flank of the Khasi Hills. Here it becomes the Jamúna for 180 miles of southerly flow across the flat plains of Bengal till it joins the Ganges at Goalanda. Then the deltas unite. After the Surma has joined from Cachar the united stream of the three great river systems takes the name of Meghna and rushes to the sea. Goalpara and Dibrugarh are perhaps the best known stations of the upper Assam Valley, and on the

influence on the distribution of the numerous species of trees to be found in the forests of the country, varying with the different zones—hot moist, hot dry, arid, temperate and arctic.

Some account of the rainfall of the continent will be necessary here, since it exerts such a marked influence on the distribution and nature of the forest growth and general flora. As elsewhere in the tropics the rainfall in India has marked characteristics, the feature of importance being the periodic rainfall or monsoons. The distribution and character of the various types of Indian forests are primarily influenced by the monsoon rainfall. The monsoons prevail at two seasons of the year. The first or south-west monsoon rains bring to an end the hot weather season, falling between June and September. They first strike and give rain to the whole of the lower western coast of the peninsula and the western coast of Bengal and Burma. The second or north-east monsoon falls between October and December, being chiefly confined to the eastern coast of the peninsula. Some parts of the country receive rain from one or other of the monsoons, other regions being affected by both. The south-west monsoon rains from the Arabian Gulf fall with their full force on the western coast districts from the Tapti southwards and the Ghát Range behind them; as also on the coast lands and outer hill ranges of Tenasserim, Pegu, Arakan and Chittagong; the plains of Bengal, the outer slopes of the Eastern Himalaya and the Khasi and Tipperah Hills. This monsoon also reaches in a lesser degree the western slopes of the Himalaya, the whole length of the outer southern parts of this great mountain system also receiving a monsoon rainfall at this period from the rain clouds travelling up from the Bay of Bengal. The north-east monsoon rains, on the other hand, provide the chief rainfall of the coast of the Carnatic, from the Kistna River southwards and inland to the outer ranges of the hills of the Eastern Gháts; of the Mysore tableland, the Javadi, etc., and even reach the edge of the Western Gháts. This region receives only a scanty and often failing supply of rain from the south-west monsoon. The regions which receive both monsoons are confined to the peninsula, the inner areas of the Deccan and the Carnatic. In addition to the monsoons, varying amounts of rainfall due to local precipitations are received in different parts of the country, as for instance the so-called "Christmas"

rains in the United Provinces and elsewhere, the showers known as the Mango showers, and the local rainfall in Assam. These are often of very considerable local importance.

Omitting the part of the country in the south which is subject to two monsoons, the cold weather season commences in October or November (the former in the northern provinces) and lasts till the end of February or end of March respectively. This cold season is followed by the hot weather commencing in early March (or early April, the latter in the north) and lasting till the monsoon breaks in early June or July. It is during the hot season that the forests suffer so severely from fires; though the modern fire conservancy arrangements introduced by the Forest Department have done much to mitigate this evil. This season is, however, a somewhat trying one for the Forest Officer.

To complete these brief preliminary remarks a glance must be taken at the geology of this remarkable continent. It is in itself a fascinating study. To Oldham, of the Geological Survey of India, in his *Evolution of Indian Geography* (Vol. III, R.G.S.), we are indebted for an extremely able account of India's geological origin. It reads like a romance, whilst at the same time affording the Forester data which enable him to understand several important factors relative to tree distribution.

“Measured by the vast ages of geological existence, the peninsular area of India (the region of southern tableland) is by far the oldest. On the north-western borders of this area, stretching across the plains of Rajputana, are the remnants of a very ancient range of mountains called the Aravalli. To the south of these mountains the peninsula of India, as we know it now, has been a land area since the close of the palæozoic era. Across the extra peninsula regions to the northwest of the Aravalli Hills the sea has repeatedly flowed even to the commencement of tertiary ages; and between the two regions thus separated by the Aravallis there exists most striking differences both in structure and in conformation. The present shape of the peninsula—itself but a remnant of a far more widely extended continent—has only been assumed since the occurrence of the vast series of earth movements which resulted in the creation of the region of depression—the alluvial basins of the Indus and of the Ganges. Over the substratum of granite and gneiss which forms the ‘bedrock’ of peninsular geologic structure, and eastward from the Aravallis, stretch the wide red sandstone deposits which are

known as the Vindhyan system, and which (even when buried beneath the Deccan trap) preserve a generally horizontal position. Geologists maintain that these widespread unfossiliferous beds are but the detritus washed down from the peaks and valleys of the inconceivably ancient mountain range which is now represented by the comparatively low and degraded Aravallis. Almost coeval with the Aravallis (and possibly at one period connected with them) is the much broken and ragged formation known as the 'Eastern Ghâts,' overlooking the Bay of Bengal. So ancient is this eastern buttress of the peninsular tableland that since the close of the palaeozoic era the waters of the bay have never washed westward, and the coast of Madras was the eastern coast-line of that pre-Indian continent of which India is now the much-diminished representative. But whilst the Aravallis were clearly the north-western limit of this prehistoric continent, it is not quite so clear what formed the boundary on the north-east. There was no Gangetic basin in those days, and it was probable that the Rajmahal Hills and the hills of Assam continued the land area to the Himalaya east of Sikkim; for it is certain that the Eastern Himalaya are vastly older than the western, and that the Burmese mountains are comparatively young. Next followed a long period of repose and of the silent process of alluvial deposit by river action, during which the wide central beds called Gondwana were formed. Here we must note the existence of ice-worn boulders and the evidence of former glaciers in Rajputana; and at this point we are faced with the almost indisputable fact that the India of the Aravallis and of the Rajmahal Hills was but an extension from South Africa. The evidence which has been collected to prove this ancient connection seems to be conclusive. Plants of Indian and African coal measures are identical, and not only plants, but the fauna of that period claim a similar affinity. Near the coast of South Africa a series of beds occur which is similar in all respects to an existing Rajmahal series; whilst the distribution of marine fossils proves that to the north-west and to the south-east respectively of a land barrier, which must have included the Maldives, Laccadives and Madagascar, were two distinct seas. This land connection must have existed at the commencement of cretaceous times. There are no marine sedimentary beds in the Eastern Himalaya analogous to those of Burma, of the North-West Himalaya and of the mountains west of the

Indus. These wide highlands, together with the great plateau of Tibet, were then under sea, subject (so far as we can tell) to no great earth movements in very early ages, but undergoing quiet and placid intervals of subsidence and upheaval, of alternate existence as open lacustrine land surface or sea bottom. At the close of the jurassic period not only were the North-Western Himalaya non-existent, but the very rocks of which the ranges to the west of the Indus are formed were still uncreated. Only the Aravalli peaks stood lonely and silent, overlooking a vast north-western sea. Not till the close of the cretaceous period was India shaken by a series of eruptive cataclysms into something of its present shape. A succession of volcanic eruptions, exceeding in force and grandeur anything that the world has ever seen (except, indeed, it be in South America), covered 200,000 square miles of India with lava and tuffs to a depth of thousands of feet. India must have been for a time one vast volcanic furnace. This was but the prelude to the mountain building. Then, at the commencement of the tertiary period, set in that long succession of earth movements which, culminating in intensity about the pliocene period, are still in perceptible activity. The sea was driven back; rocks were crushed and forced upwards until marine limestones were upheaved to 20,000 feet above sea-level. Then were the sea-formed rocks of the trans-Indus hills ranged and folded and set in order. It was the period of the creation of our Indian frontier.

"Geologists have decided that the fossils of Burma and of the western frontier alike place the formation of these regions in the eocene, or latter part of the tertiary era. But the great bulk of the North-Western Himalaya must have been a formidable mountain barrier in times previous to the eocene period, and, moreover, even in those early times, the river systems of the Himalaya must have been traced very much as they are at present. At the foot of the Himalaya there existed for geologic ages a long series of river deposits which have been compressed and upheaved in very recent times to form what is known as the Siwalik Range, an entirely subsidiary and secondary range of hills which flanks the Himalaya on its southern face, forming an elevated longitudinal valley, in which Dehra Dun is situated, between itself and the foothills of the main system. In the neighbourhood of those rivers which issue from Himalayan valleys and cross the elevated valley and the bordering Siwalik Hills there have

been found beds of conglomerate which prove by their composition that rivers large and rapid, having their sources in the Himalaya or beyond, must have passed that way from time immemorial very near to their present channels; and the evidence of the rocks connects the origin of these rivers with the pliocene period. Thus it seems probable that the North-West Himalaya existed as mountains of very considerable altitude in pliocene times. Another result of this succession of earth movements was the formation of that great Indo-Gangetic depression which forms one of the natural geographical divisions of India. The break in the connection between the Rajmahal and the Assam Hills which gave an opening for the eastward flow of the Ganges is comparatively recent. Originally the whole southern flank of the Himalayan system was drained by the Indus, and the diversion of the Jumna eastward into the Gangetic basin may be almost historic. Probably there was an interval, during which the Jumna either joined the Indus, or found a way south-west through some of the dry river channels still existing across the Rajputana desert. The present division of the two drainage systems, or water parting, is now marked in the Himalaya by a ridge on which stands the church at Simla. [It is further probable that the same earth movements caused the submergence which separated India from Africa. By the end of the eocene period the west coast of India was formed, and the only existing evidence of that old-world connection is now to be seen in the islands of the Laccadive and Maldive groups.] The Western Gháts, facing the Arabian Sea, are of quite recent formation, exhibiting some of the hydrographic phenomena which are common to mountains belonging to similar periods, with rivers cutting their way back from narrow and steep-sided valleys, and still changing their features from day to day. From the Western Gháts all the peninsular rivers of India run eastwards, with the exception of the Narbada and Tapti. From the edge of the Tapti basin to the extreme south, the Western Gháts form the main water parting of the Indian continent."

CHAPTER II

THE EARLY HISTORY OF INDIA AND ITS INFLUENCE ON THE FORESTS

THE early history of the Forests of India is closely bound up with the history of the ancient inhabitants, as has been the case in many other parts of the world. For with the increase in population the activities of man have, so far as the forests of the world are concerned, been a history of devastation, carried on throughout the ages down to present times.

There seem to be few reasons for doubting that in the recent post-tertiary period, even within historic times, the greater part of the country now comprising our Eastern Empire was covered with more or less dense forests populated by aboriginal tribes. The existing remnants of former forest growth, to be alluded to in greater detail in an ensuing chapter, and physical reasons, tend to show that this contention can be put forward with some certainty. But historical indications of the former great forest wealth of the country are also extant. A brief exposition of the ancient history of man in India is a necessary preliminary, therefore, to a consideration of the forest history of the country.

The geographical position of India shut off to the north and north-east by a giant mountain wall and surrounded on the other sides by sea has inevitably shaped both the history and destinies of its inhabitants. Holdich describes India as a geographical *cul-de-sac*, possessing a soil particularly favourable to the increase of mankind. From time immemorial India has been peopled by immigrants who have multiplied with so great a vitality that none of the recent waves of conquest sweeping through her few gateways on the north-west have made any permanent impression, save to add another item to her bewildering ethnography. The north-western barrier mountains have been already alluded to. They have proved of immense importance in the past in

populating the country. These mountains are difficult, rugged and often dangerous ; yet owing to their lesser altitude they have not offered an obstacle to invasion of such impossibility as is presented by the Pamirs to the north and the Himalaya to the north-east. Moreover, there exist a few corridors and low passes, the historic "gates of India," through this lower mountain barrier, and it is through these that the flow of immigration or invasion has almost invariably advanced.

No single name existed amongst the early settlers to include the various races of the country. The nations of both the East and the West first knew India as the land of the Indus. For this great river of the west was the first barrier which opposed the immigrants or invaders through the north-western corridors. The Indus with its network of waterways and islands appeared to them a sea, and they gave it the Sanscrit word for ocean, and Sindhus gradually became the recognised name for the districts watered by the Indus. Other variations in nomenclature followed. To the ancient Persians India was known as Hindu, to the Greeks Indikos, and Virgil called the country India. Modern Persians gave it the name of Hindustan, an application now commonly applied to the whole country.

The records of the races who first occupied the Indian peninsula are very meagre and uncertain. Tradition, as embodied in the great epics the Mahabharata and Ramayana, tells us in obscure and legendary fashion of great northern invasions, such as that of the Aryans 2000 B.C., and others, under which the aborigines of the plains were gradually pushed southwards. There are allusions to whole populations moving from High Asia and sweeping into India through the north-western corridors ; indicating that throughout historic ages the land routes into India have always remained the same as at the present time. As regards sea routes, the first authentic sea trade with India was that maintained by the fleets of Solomon and Hiram, whose ship captains, according to Hunter (*Imperial Gazetteer*), "not only brought Indian apes, peacocks and sandal wood to Palestine ; they also brought their Sanscrit names." The absence of authentic early records must be attributed to the philosophy of the Brahmanical school which actually forbade such records of the social environments and activities of man to be kept. It is this philosophy that has resulted in an almost complete absence of early records detailing the history of what must

have been a highly organised Aryan community. It was from the West and from the Greeks that the first historical knowledge of the East was derived. Hekataios of Miletus (549-486 B.C.) was the first so far as is known to give to India a geographical definition, whilst Herodotus (450 B.C.) gives the political division of the countries bordering India, his eastern boundary of India being limited to the Indus.

It rested with Alexander the Great, as a result of his great military invasion of India about 327 B.C., to give the Western nations their first accurate ideas of the physiography of India, and the data obtained as the outcome of this great expedition remained all that was available for several ensuing centuries. In addition to the Helmund, Indus and Kabul Rivers, several of the rivers of the Punjab were correctly placed. As an indication of the extraordinary ignorance of those times, Alexander believed that the Indus was identical with the Nile! The exploration of the Indus during the great retreat and the voyage of his gallant Captain, Nearchos, from the Indus to the head of the Persian Gulf dispelled that idea. The records kept of this great expedition have proved invaluable. For not only has it proved possible to trace the whole of the return journey of both Army and Fleet to Persia, but modern geographers have been able to estimate the nature of the changes which have taken place during the past twenty-two centuries in the riverain and coast topography; and modern foresters have been able to ascertain the devastation of the forests which has obtained. Alexander never got further than the Beas River in the Punjab and died soon after his return to Persia.

One of his Generals—Selenkos Nikator, founded the Syrian Monarchy and despatched an Ambassador—by name Megasthenes—to the Court of the great Indian King of the day—Chandra Gupta—who had his capital at Patna on the Ganges in what is now the province of Behar and Orissa. Gupta was called Sandrakottos by the Greeks, and his capital Palimbothra. Many of the Greek settlements in the northern Punjab and Kabul valleys were ceded to Chandra Gupta about this time, but Greek influence and the Greek language persisted in the northern regions for seven centuries and more after Chandra Gupta's death, till it was finally stamped out by the Mahomedan conquests. And many place-names in those parts at the present day are mere adaptations of the former Greek names. The Ambassador Megasthenes

was an observant man and kept careful records of his journeys, and it is from him that we learn that this was the period of early rivalry between the two great religious cults of India, Brahmanism and Buddhism. The Ambassador was also the first to describe, for the benefit of the Western world, the great Indian system of caste, under which the people were divided into social sects.

There were other influxes of races in addition to the great Aryan invasions of India, which gave the "race type" to Indian civilisation, and the far shorter period of Greek invasions, whose chief effect was to leave a marked impress of Greek culture on Indian Art for many centuries after the Greeks had vanished. The very earliest traditions indicate a more or less continuous movement of the Turanian peoples of High Asia who advanced or were pressed into India through the north-western corridors. It was to this cause that the Greeks owed their downfall and disappearance, Turanian sovereignty being established in Northern India about the beginning of the Christian era. From this period onwards the history of the people of India again becomes shrouded in indefiniteness until the rise of the Mahomedan power some seven centuries later. During this long period the chief records extant are those of Chinese pilgrims who journeyed through the most difficult and wildest of the Himalayan passes with the object of visiting the mediæval Buddhist centres of High Asia. Into these interesting records it is impossible to go here.

It will be necessary, however, to consider briefly the effect which the civilisation of the Western nations was having on the East. With the demand for luxuries in Ancient Egypt trade commenced with India and the East in very early times, and the trade grew in value with the increase in culture of the West. The Western nations soon realised the value of this trade and the great increase in importance and power which it conferred on the nations who enjoyed the largest share. From the very first the trade was in Semitic hands. When Israel was still a nation the trade routes from India by the Persian Gulf and Euphrates or by the Red Sea were well-known commercial channels, as also the time-worn track to Mecca. All in turn, Egypt, Assyria, Babylon, Persia, Macedonia and Rome, made great and in turn successful efforts to secure the command of the trade routes. The Suez Canal would have been excavated two and a half

centuries before our era had not Ptolemy Philadelphus feared inundations as a result of its construction. By the first century A.D. merchant craft were crossing the Arabian Sea, Hippalus having discovered how to make use of the monsoon winds for the purpose ; the sea trade having been previously confined to a coast trade, chiefly Egyptian. The decline of the Roman Empire about the sixth century A.D. saw the rise of the Saracens and Arabs, and Bagdad and Basra become influential and very wealthy commercial centres.

Important as the sea routes were in connection with the Indian and Eastern trade, the old land routes were evidently utilised for commercial purposes from the very earliest times, and continued to be so used until about the fifteenth century A.D., when the Turks and the Moguls finally closed them. The history of these land routes into India forms a fascinating study. Among the most important were those connecting Northern India with the Oxus, which then struck into the great trans-Asian route of the silk trade with China, reaching Europe by way of the Caspian or Black Sea. All High Asia shows a network of these ancient Arab trade routes, and many remains of ruined cities and so forth indicate the great wealth and magnificence of the old cities of the Oxus basin. Another important route, to secure which was doubtless the object of the Arab advance into Sind, in the eighth century A.D., was the direct land route between Western India and Bagdad, which passed through Mekran and traversed the length of South Persia.

The Mahomedan conquest of Sind and the gradual establishment of Mussulman dynasties in India coincided with the disappearance of Buddhism from the land of its origin, although Buddhist provinces maintained the struggle for some time thereafter. This invasion by the Mahomedans was not made by way of the old north-western corridor routes of entry into India. It proved the one exception to the methods by which India had been successfully invaded. The Mahomedans came from the Persian border and had the assistance of a fleet as they held the command of the sea, a command which was indispensable to an invasion from any sea quarter.

From this period till the fifteenth century the Mahomedan power held sway and received great wealth from the flow of commerce passing from East to West, by both land and sea routes. The change came when the Crusaders broke the

power of the Saracens, and soon after the Turk and Mogul rose to power and swarmed into Western Asia and blocked the Indian trading routes for a time.

It was probably this action on the part of the Turks which brought home to the Western powers the true position ; for the great struggles between them during the next three centuries were undertaken with the object of obtaining command of the Eastern Ocean. Arabia became the first mistress of the seas, and the Arabs alone for centuries possessed the knowledge of the commercial geography of the East. When the Western nations commenced to enter into competition it was the Venetians who first arrived, Venetian merchants having settled in Constantinople after its capture by the Crusaders in 1204. For fifty years the Venetians held possession of the Black Sea trade and maintained the upper hand in the Mediterranean. Then came the ascendancy of the Genoese about the middle of the thirteenth century. They were ousted by the Turks, who captured Constantinople in 1453. The Turk had considerable difficulty in holding his own at sea against the Arab, and both were still sea powers at the time of the discovery of the Cape route to India by Vasco da Gama in 1497. This opened a new commercial route to India and struck a blow at the jealous guard of the old land routes maintained by the Arabs and Turks.

The Portuguese came on the scene early in the sixteenth century, and obtained a complete ascendancy over the Eastern trade from Japan to the Cape of Good Hope, a hold which they maintained throughout the sixteenth century. When the Portuguese first arrived in India, Delhi and the whole of Bengal were under the sway of the Afghans. The Deccan was divided into the five Mahomedan kingdoms of Ahmednagar, Bijapur, Elichpur, Golconda and Bidar.

But Vijayanagar, the great Hindu rajah who ruled the whole of the southern provinces, was the most powerful and magnificent monarch of the period. The decline of the power of the Portuguese was as rapid as its rise. By 1683 it had almost disappeared, the Mahrattas had advanced to the gates of Goa, the Portuguese capital, and the rest of their history in India is negligible. They now hold only Goa, Daman and Diu on the west coast, with an area of about 2350 square miles and half a million or so of population.

The Dutch were the next to appear in the field. They were the pre-eminent power on the high seas at this time. In 1651

they founded a colony at the Cape of Good Hope, and in 1658 they captured the last stronghold of the Portuguese in Ceylon. The Dutch enjoyed a century of supremacy, their power in India being finally broken by Clive at the Battle of Chinsura, 1758, and subsequently they entirely disappeared from India. The French and English then commenced the struggle for supremacy in the country.

The history of the English in India presents quite a different aspect from that of the other Western nations who in the past had fought for and held supremacy. The latter fought with the primary object of obtaining the ascendancy over the trading routes. The Arabs, the Portuguese and Dutch only held a narrow fringe on the coast of India, where the two latter powers set up factories at which the valuable merchandise was collected. They held no important positions inland. The French and English commenced in the same fashion, but each in turn advanced inland. In the ensuing struggle the French were beaten, and the modern British Indian Empire with its sway over the wild borderlands to north-east, north and north-west and its hold of the sea and supremacy in the Persian Gulf came into being.

A brief glance must be given at the events following the arrival of the British in India, since it is of importance to a subsequent understanding of the position and their attitude towards the forests during the first half-century of their rule in the country.

As has been shown the Portuguese were the first amongst the European Powers in the field in India, and they waged a long struggle to maintain exclusive possession of the rich monopoly of Oriental commerce. The Dutch (then known as the Netherlanders) enjoyed a share of these profits, as they acted as carriers between the Portuguese factories and the northern nations of Europe. In 1570 the Dutch formed themselves into a separate Government in defiance of the power of Philip of Spain, who then governed with an iron rule the united kingdoms of Spain and Portugal. Incensed at this open defiance Philip forbade the Portuguese to employ the Dutch any longer as intermediaries, and this prohibition led the latter to start commercial operations on their own account. They formed various trading settlements in the East in the commencement of the seventeenth century and eventually supplanted their former employers.

England entered into this competition at the same period.

A company of London merchants initiated an attempt to trade with India, being warmly supported by Queen Elizabeth, who never lost an opportunity of opposing Philip of Spain. Several of the first English expeditions met with disaster, whilst those of the Dutch were highly successful. It was the grasping policy of the merchants of this latter nation in raising the price of pepper from three to six and eight shillings per pound (the cost in India being two to three pence), which actually led to the formation of the British East India Company. A meeting of London merchants, headed by the Lord Mayor and Aldermen, was held at Founder's Hall in London on 22nd September, 1599. At the meeting a company was formed for the purpose of setting on foot a voyage to the East Indies. The stock, considered a large one at that time, amounted to £30,133 1s. 8d., divided into 101 shares or adventures, the subscription of individuals varying from £100 to £3000. Queen Elizabeth was petitioned to grant a Charter of Incorporation to the Company. She delayed for a few months as negotiations were being carried on at the time with Spain through the mediation of France. These negotiations fell through, and the discussion of the East Indian trading question was then taken up eagerly both in Court and City circles. On the last day of the year 1599 Elizabeth signed a charter on behalf of about 220 gentlemen-merchants, and other individuals of repute constituting them "one bodie-corporate and politique indeed," by the style of "The Governor and Company of Merchants of London trading into the East Indies." This was the origin of the Charter of the East India Company, which subsequently gave rise to the dual Government of India by the Crown and the Court of Directors of the Honourable The East India Company, which was to last until the Indian Mutiny threatened to lose us India.

The sixteenth century, especially during the reign of Elizabeth, had witnessed an extraordinary progress in the bid for commercial supremacy by England; and in great daring and intrepidity in sea exploration on the part of a score and more brilliant sea captains. The issue of the above Charter, although Elizabeth did not live to see the first fruits thereof, was a fitting termination to a period which had seen the foundations of the British Empire surely and truly laid.

During the seventeenth century the English remained simple traders in India with no cravings for political or territorial aggrandisement. They remained absorbed in the business

of buying and selling, and were only anxious for the safety of their fleet, which rapidly became more formidable and extensive in proportion to the rich freight it had to convey through seas infested with pirates and frequently occupied by hostile European fleets. A second Company to trade with India had been formed in London and received recognition from the English Government in 1698. The two companies after considerable friction and loss on the part of each were amalgamated in 1708.

Louis XIV's great minister Colbert, the progenitor of Forest Conservancy in France, formed the first French East India Company on the model of that of Holland in 1664. This Company carried on operations with various vicissitudes throughout the next century. But the French regarded their presence in India more from the political advantages to be gained than the commercial, as we subsequently discovered.

The eighteenth century opened on an entirely new phase in Indian annals. The decay of Mogul power, which had begun before the death of the Emperor Aurungzebe in 1707, was greatly accelerated by that event, and by the usual war of succession which inevitably occurred amongst his sons. The will of the dead Emperor decreed the division of his dominions amongst them, but instead of consenting to this division they fought amongst themselves and the survivor, Bahadur Shah, was left to rule the scattered territories forming the empire. Amongst these several units there was an entire lack of cohesion and organisation. At the time Aurungzebe deposed his father, Shah Jehan, condemning him to lifelong captivity, the dominions were comparatively well governed, and had the former, a man of unquestioned ability, set himself to consolidate the empire into a homogeneous whole it might have kept together. But he spent his time in overrunning and spreading desolation and ruin amongst neighbouring independent states regardless of the internal decay which was sapping the very heart of his empire.

Such was the position of India when the East India Company began to exchange their position as traders on sufferance for that of territorial lords. The first steps taken in the latter direction, as East India House records clearly indicate, were by no means voluntary. For the English merchants were still essentially traders, and had persistently opposed the acquisition of territory and dominion. And the official correspondence of the time shows a complete ignorance of, and consequently

indifference to, Indian politics, and little knowledge of the creeds, manners and customs of the people.

A time arrived, however, when the English could no longer shut their eyes to the alarming political and social state of India. Every decade the disorganisation increased. With the exception of certain Hindu native states—Mysore, Travancore, the mountainous principality of Coorg and a few others—which had escaped Moslem dominion, the rest of the country was nominally under the rule of the Mogul, and strife and anarchy spread throughout the length and breadth of India. This was no organised struggle of race against race or creed against creed ; it was the break-up of a loosely knit mighty empire. For Mussulman fought against Mussulman, Hindu against Hindu, and each against the other ; Afghan warred with Mogul, Mogul with Rajput ; and the Mahrattas against all. And the Pindari, Dacoit and Thug pursued unchecked their murderous and thieving avocations in broad daylight. The peasant went armed to his plough, the shepherd with his flock. Peace and safety were non-existent.

The English were forced to fortify the various factories which had been gradually established in different parts of India (included, according to their situation, in the three presidencies of Calcutta, Madras and Bombay). Armed neutrality was, however, scarcely practicable, even had they only to protect themselves from the numerous warring native powers. But this was not the case. The conduct of their European rivals forced the English into active intervention if they were to avoid being swept out of India altogether. The French East India Company had proved a failure so far as trade was concerned. Their employees were not the equal of the English as factors. But as political agents they showed themselves possessed of diplomatic instincts superior to the English.

Durmas, Dupleix and the gifted La Bourdonnais entirely upset the English attitude of aloofness from all interference with the politics and quarrels of the native kingdoms, to which they had adhered so strictly during a century.

The Frenchmen saw clearly the opportunity afforded for the territorial aggrandisement of their country, and they eagerly took part in the quarrels around them, making offensive and defensive alliances with the neighbouring states, interfering in cases of disputed succession and taking every

step possible to attain political power in the country. Although the English representatives of the East India Company were not the equals of their rivals in ability of this kind, they recognised the danger of their position and followed the example of the French in organising and drilling forces of native troops on European lines throughout the British settlements. The struggle between the two great European powers in India then commenced, at first merely as auxiliaries to rival native princes only. The outbreak of war between the French and English in Europe brought the opposing forces of the two nations into direct hostility in India. The Carnatic in the Madras Presidency was the scene of this great struggle, out of which the English emerged victoriously.

In Bengal a struggle, which meant nothing less than their expulsion to the British if defeated, also took place against the usurping Mahomedan Governor, Surajah Dowlah. The Mogul Empire had by this time become an empty name so far as its distant provinces were concerned. There was no native state in existence strong enough to protect the British settlements or just enough to be trusted. Surajah Dowlah, a young man of extraordinary beauty, had proved so absolutely depraved and dissolute that he was loathed and distrusted by Mahomedans and regarded with horror by the Hindus. The English were fortifying Calcutta to protect it from an attack by the French, with whom Surajah Dowlah was in collusion. The latter ordered the fortification work to cease, and on representations being made as to the necessity of the step, he advanced, laid siege to the town and captured it in June, 1756. The place was pillaged and the Europeans captured were placed in the "Black Hole," from which few emerged alive the following morning. The tidings of this infamous act spread like wild-fire through the British settlements, and though a peace was patched up with Surajah after Calcutta had been recaptured it was felt that no reliance could be placed in the word of a prince who was not only distrusted, but hated by his own people on account of his depravity and extortions. The Hindus were daily becoming more impatient of the Mahomedan yoke, and the haughty Mussulmans were themselves divided regarding their ruler. The latter in violation of the treaty recommenced negotiations with the French.

Calcutta had been recaptured by Robert Clive with a force of 900 European troops and 1500 sepoys, aided by the Fleet

under Admiral Watson. On discovering that Surajah Dowlah was again plotting with the French with the object of attacking the English, Clive, by means of methods of a rather dubious character, secured the support of some of Surajah Dowlah's ministers and then advanced to give battle to the Governor's Army. Clive had only 3000 men, but 1000 of these troops were British. The Governor's army outnumbered them by 20 to 1, and one of the latter's ministers, who commanded a division, and had promised to join Clive at Cossimbazar, failed him and marched to Plassey with Surajah Dowlah's army. The latter had a contingent of French Artillery with him and many elephants. But the issue was never long in doubt and Clive won the Battle of Plassey (1757), which was followed by the flight of Surajah Dowlah and the subsequent establishment of permanent British Dominion in Bengal.

This victory sounded the death-knell of the French in India. In the last struggle for supremacy the gallant but ill-fated Lally was defeated in Madras, and the French power in India came to an end in 1760. Tippoo Sahib, however, still ruled as Sultan over Mysore, Malabar and Coorg, and to him the French turned to make one more effort to retrieve their position. In the first struggles with Tippoo he was defeated in 1792, and in the peace conditions accepted by him he ceded to the English Malabar and Coorg, together with Dindegul, Baramahl and the Lower Ghâts. Within a brief interval Tippoo again commenced intriguing with the French with the object of securing their aid and help from Mauritius against the British. He was eventually defeated and slain at the siege of Seringapatam in 1799; and the British assumed sway over the greater part of the Madras Presidency. By this time most of lower Bengal and parts of the Bombay Presidency were in British hands or under British influence.

Success followed success almost without effort. The acquisition of province after province came less from any premeditated plan than from force of circumstances and the impossibility of standing still without hazarding the position already gained. Almost in spite of ourselves we went on extending the limits of the Empire with marvellously little effort on our own part, and this result has proved highly beneficial to the great number of different races in India. For never in its past history has the country been so uniformly tranquil or so prosperous as has been the case under the British Raj.

But our political ascendancy in the country was not pre-meditated, almost, it may be said, to have been an accident forced upon us. In the words of an old Rajput Prince in conversation with a British official in 1804 (alluding to a kind of melon which bursts asunder when ripe), " You stepped in at a lucky time ; the *p'foot* was ripe, and you had only to take it bit by bit."

The new position which the East India Company was being forced to take up in India proved a difficult one to manage from home. The Court of Directors were ignorant of the real position in the country, and the practice which permitted private trading by their employees from the senior officials downwards led to great abuses. The Company became involved in financial difficulties and were threatened with bankruptcy. They appealed for help to the English Government and a parliamentary investigation was carried out in 1772. This resulted in the first direct connection of the Home Ministry with the management of East India affairs by the measure known as the Regulating Act of 1773. A loan of a million and a half was authorised to the Company and various provisions were made to amend the constitution of the Company at home and in India. A Governor-General (Warren Hastings) was nominated to preside over Bengal, and to control to some extent the Presidencies of Madras and Bombay, with four councillors, all nominated for five years. A supreme court of judicature was created in Calcutta, to take the place of the old Mayor's Court. And finally all Company's employees, judges, collectors and military officers, both of the Crown and the Company, were strictly forbidden to trade. This double government was destined to last till the Indian Mutiny.

The influences which the incidence of the successive waves of invasion and immigration into India had on the forests will now be glanced at.

The Aryan invaders, as mentioned, probably entered India some 2000 years B.C., and such evidence as has been collected tends to show that they were an agricultural and pastoral people. In order to carry on their pursuits they commenced burning and clearing away the dense forests in the areas in which they settled in order to obtain land for the growth of crops and on which to graze their cattle. The ancient epic Mahabharata tells of the burning of the great Khundava Forest. This forest appears to have been situated between

the Ganges and Jumna Rivers, and the description forms the first semi-historical evidence of the destruction of the forests by the early settlers.

The legend relates that the burning of the forest was only carried out with great difficulty owing to the frequent rains which Indra poured down to quench the fire. Allusions are numerous in the epic to dark and gloomy, and we may be sure dense and tangled, forests as still covering large portions of the country even within what are now the drier zones along the banks of the Jumna. But it is also made evident in the epic that in other parts the early settlers had already cleared large areas for cultivation, etc., in those ancient times and that a terrible drought and famine had devastated the country, dreaded experiences which were doubtless reproduced more than once. For in the second epic, the Ramayana, dating from the time when an Aryan Empire was established in Oudh, there are allusions to severe droughts, and Sringa, the forest-born, is worshipped as the bringer of rains. Forests, dark as a cloud and very dense in the wilderness of Taraka, are spoken of here.

At the time of the invasion of Alexander the Great the forests in the north of the Punjab were still dense, in spite of this being the part of the country in which the Aryan invaders first developed a stable Government. For we are told that the Salt Range and the country on the banks of the Jhelum were clothed in forests dense enough to conceal the movements of Alexander's armies. Those who accompanied Alexander kept careful notes of the regions he operated in, and in his history of the invasion Arrian, in describing the march east of the Jhelum, says that the forests there extended over an almost boundless tract of country, "shrouding it with umbrageous trees of stateliest growth and of extraordinary height; that the climate was salubrious, as the dense shade mitigated the violence of the heat, and that copious springs supplied the land with abundance of water."

This description would seem to apply to the Pabbi and probably to the low-lying country between that range and the Chenab, over the southern portions of which *Dalbergia sissoo* and *Acacia arabica* are still to be found scattered. The evidence is of importance, for Arrian describes the high *ber* (i.e. the high plains tableland between two rivers), lands of the Punjab west of the Ravi—the Rechnat Doab—as in much the same state as when the British entered the Punjab some twenty-one

centuries later. It is our great new irrigation system which has since turned much of this into valuable agricultural properties.

It appears probable that during the whole of the Brahmin and Buddhist periods, forests still existed over a considerable part of India adapted to the growth of such, the valleys and land areas adjacent to the larger rivers being under an intensive cultivation. The great reduction in the forest areas in the country was slowly brought about by the constant invasions of the Central Asian peoples who brought their flocks with them ; and as both people and flocks increased in numbers, wider and wider areas of forest were burnt and destroyed to obtain pastures for them. This period may be said to have culminated with the Mahomedan conquest of a large portion of India. The Mahomedan had no regard for the forests, nor any religious scruples about destroying them. Rather, he was taught that the forest was a free gift of Nature and belonged to anyone, just as water did. The destruction, therefore, proceeded apace. India suffered from Mahomedan incursions just as Persia, Asia Minor, Spain and other countries on the Mediterranean suffered.¹ But a part of the destruction of the forests was probably carried out by the original agricultural population who, under the ever-increasing stream of invasion, were driven back into the forests and hills and mountains where they took to the method of shifting cultivation, which under various names has been practised in the forests of India during many centuries and still exists in some parts—a pernicious system which is probably as destructive to forests as any other act of man.

On the other hand, the planting of trees either for the fruit which they yielded or for the purposes of obtaining shade was an act which was held in high esteem in Eastern countries, and especially in India, from very early times. The Eastern

¹ Whilst out at the Serbian Front in Macedonia in 1916, the writer was given the following curious and interesting reason for the treeless state of Macedonia by a French officer who had been connected with the French Forest Service. He said it was supposed to be due to an old Turkish law which assessed the amount of taxes to be paid by landowners according to the number of trees they had growing on their land. To diminish the amount of taxes to be paid the landlord cleared off all his trees and thus brought the hill-sides to their present bare state. This would be very like the Turk. Its effect, however, combined with the unrestricted grazing of flocks of goats, has been to reduce the value of the agricultural land at the foot of the hills owing to the soil becoming covered up with rocks and debris, the result of erosion in the hills now unprotected by trees, and to render the climate hotter and more unhealthy.

appreciation of the luxury of shade led to the banks of the canals, constructed by the Mahomedan Emperors, being planted, and the waysides of the Imperial highways being lined with trees of various kinds. In the Sunnud of the Emperor Akbar, it is directed "that on both sides of the canal down to Hissar, trees of every description, both for shade and blossom, be planted, so as to make it like the canal under the tree in Paradise ; and that the sweet flavour of the rare fruits may reach the mouth of every one, and that from those luxuries a voice may go forth to travellers calling them to rest in the cities where their every want will be supplied" (*Calcutta Review*, No. 23).

That the wholesale destruction of forests has had a serious deteriorating effect on the climate of India is beyond cavil. What may be termed the historical proof of this contention is furnished by the numerous deserted sites of old towns and villages, now represented by ruins of walls or mounds either buried in the sand of a desert or overgrown by dense jungle, which indicate that the areas were once more or less densely populated, but where present-day human activity is only represented by a scattered population and scanty agriculture. The desertion of these formerly populated areas has not been, in the main, due to depopulation owing to invasion and extermination, nor was the cultivation due to extensive irrigation, for evidence of such works would have remained extant ; and there is no such evidence. The disappearance of the people of these old densely populated areas was mainly brought about by the reckless, continuous and wholesale burning of the forests which led to the gradual decrease of water in the larger rivers, to the drying up of springs, small streams and rivers and to a decrease in the rainfall of the country. This result was gradual, the war against the forests being spread over many centuries, probably 3500 years or more ; for the Mahomedan rule alone had lasted 750 years at the time the battle of Plassey was fought and won by the English, and the invasions of India by the nomadic tribes from High Asia had continued for many centuries previous to the Mahomedan conquest of the country.

From what has been written above it will be seen that areas once under cultivation have in some cases, since relapsed into jungle, again, become reafforested by Nature, in fact, thereby proving that if left undisturbed by man, areas suitable for carrying forests would soon become re-clad, given that the

other necessary conditions were favourable. Numerous proofs that this is the case are to be seen in India, and many Forest Officers will have encountered one or more instances.

Ribbentrop mentions that throughout the Gumsur Forests in the Gangam District very old mango and tamarind trees are to be found in groups in the forests, now surrounded with sâl trees, often of very fine growth and probably at least 200 years old. These clumps probably represent the sites of old villages in the area which was once under cultivation. Depopulation may have been due to the descents of the hill tribes (Khonds) of the neighbouring regions, or to drought and famine or pestilence. The people disappeared and the cultivated lands soon became covered with a fine crop of sâl saplings. The writer has seen the same thing in Chota Nagpur and the Central Provinces, where the ruins of old buildings and tanks are not uncommon, now buried in a dense tangle of jungle affording homes to wild animals : and in the Chittagong Hills the same ancient ruins of an old civilisation may be seen.

Therefore, although it is certain that the area of forests in existence in the country at the present time is but a fraction of those existing in the early history of the country, and that the destruction of the greater bulk has resulted in a far hotter and more variable climate ; yet evidence is not wanting that suitable areas throughout the country if left untouched by man would once again become re-clothed with forests.

The trouble arises in the drier districts where bare, hot, deeply-seamed hill-sides, or great stretches consisting of a network of barren, hot ravines, once clothed with forest, now require to be reafforested in the interests of the people. Nature is unable to do this, and it becomes the work of the scientific Forest Officer to grapple with the problem.

CHAPTER III

POSITION OF THE FORESTS AT THE TIME THE BRITISH ACHIEVED SUPREMACY IN INDIA

IT has been shown that the constant streams of immigration and invasion to which India was subjected during the 3800 years, which roughly elapsed between the invasion of the Aryans and the advent of the English as Rulers, resulted in the destruction of a very large proportion of the forests which originally covered great tracts of the country. The forests had, in fact, in some parts already been reduced below the minimum essential to the well-being of the country and its inhabitants when the English first began to achieve supremacy in the middle of the eighteenth century. As will be described in subsequent chapters this state of affairs did not improve, but the destruction of the more accessible forests increased during the early days of British occupation. The new Administration possessed no knowledge of tropical Forestry, nor, indeed, of European Forestry, since British Forestry had almost ceased to be understood as a commercial enterprise in Great Britain. Coal, in a larger degree, was replacing wood fuel, and with the realisation of the value of teak the British Admiralty were soon engaged in enquiries with the object of replacing oak timber by teak from India for use in the construction of the Fleet. For the supplies of first-class oak timber were falling short in England owing to the cessation of planting, which had fallen off to a great extent early in the latter part of the eighteenth century.

The British were not the first in India to make indents on its timber wealth. For a long period before their arrival timber had been exported in large amounts to Arabia and Persia. For a considerable period the Arabs had possessed a powerful fleet in the construction of which teak was used ; and the valuable sandal-wood of South India had for many centuries found its way by the sea and land routes to the

Western markets ; as also had the satin-wood, ebony and blackwood.

Investigations carried out at the beginning of the nineteenth century proved that the big cities of India surrounded by a dense agricultural population were already short of timber, which was being transported to them from forests situated at considerable distances. The fellings carried out to supply these requirements were in the hands of bands of timber merchants, who readily obtained short leases from local officials in charge of the localities, or from those who claimed the ownership of the forests, and felled the big timber and any smaller material that had a sale, destroying all young growth of every description by the reckless methods of extraction employed. Their methods were so inferior that probably not more than 30 to 40 per cent of the timber thus felled ever reached the markets.

The ownership of the forests and waste lands of the country had almost invariably been claimed by the *de facto* ruler at the time. But free access to hack and burn at will was permitted, save in the case of certain species of trees which were considered the prerogative of the ruler whose felling without permission was forbidden. Tippoo Sahib, in Southern India, had created a monopoly in teak, the tree being constituted a "royal" tree, the felling and sale of which he kept in his own hands. In Burma the Alompra dynasty had taken the same action. In a similar manner the sandal-wood of Mysore was constituted a monopoly of the ruler.

But these monopolies did not afford any protection to the trees or forests which they affected. The ruler sold blocks of forest for a certain sum down or rate per tree, and the timber merchants were then allowed to fell as they pleased and ruin what was left.

These fellings and the wasteful forms of extraction were greatly intensified during the early days of British occupation, owing to the varied demands made by the latter for military and other purposes and to supply the teak export trade. Another destructive factor was the pernicious system of shifting cultivation which had been in force for centuries. Under this system an area of forest was felled by the forest dwellers, the material burnt, the ashes spread over the area and a crop sown. As soon as the crop ripened it was reaped. The cultivator might raise a second crop on the same area. By the end of this period the growth of weeds would become

very heavy, and he then shifted to a new piece of forest which was treated in the same manner. This practice, the most wasteful of all methods of forest utilisation, was in full force at the time of the arrival of the British, and thousands of square miles of the valuable forests of the country had been laid waste by the system, the formerly fine timber forests being replaced by a worthless scrub. For the areas so treated were quickly occupied again and covered by the quickly growing, worthless, soft-wooded species, or by bamboos or grass, and in the south by great tracts of plantains which were worthless from an economic point of view. It is impossible to compute in figures the value of the vast forest resources in timber and other valuable forest products which were wasted by the practice of this method of crop cultivation, a method which, as has been shown, was forced upon the peace-loving portion of the population constantly pressed backward through the ages into the forest-clad parts of the country by the pressure of the invading hosts entering India from the north-west. But that the system should have persisted for so long under the British regime and be still in force in the more remote parts of the empire at the present day is a fact significant of our ignorance of Forestry in the past and what Forestry implies in the economic life of a nation. In spite of the lessons learnt in India it was left for the Great War to bring home to the British Empire the full meaning of the great potential value of its forests.

Nor had the British any ideas on that other matter of vital importance, and more especially in a country of tropical heat such as India, viz. the effect of large areas of forest on a climate of a country. But as our first operations in India were confined to regions near the seaboard a consideration of this question will be left to a later stage in this history. But long before our arrival the Indian ryot had begun in many parts to realise that water was diminishing, that streams and springs were drying up, and that areas which his ancestors had been able to cultivate were now becoming useless for cultural purposes, owing to the—to him inexplicable—drying up of the streams upon which they had depended for irrigating the crops. Whole villages had to move to more suitable sites, and this process had been taking place for centuries, as is evidenced by the remains of old town and village sites scattered all over the country, some of them buried in sand in the centre of an unproductive wilderness, whilst others are enveloped in jungle

which has sprung up on the deserted fields. For with the disappearance of man in such areas the hill-sides became re-clothed with jungle, and the water had once again filled the streams and springs.

These processes were not, however, appreciated in those early days of our supremacy, nor had we any close knowledge of even a fraction of the country.

No forest policy was initiated when we commenced to govern India, nor was it realised that any such policy was necessary. With the exception of a few "royal" trees such as teak, sandal-wood, etc., the felling of which was retained, and only nominally retained—for illicit felling and smuggling was rife throughout the country—in the hands of the rulers of the particular territory, the forests were free to all to take what they required, to hack and burn down; or to fire annually in order to obtain a fresh crop of young grass with the arrival of the monsoon for the grazing requirements of their cattle.

When the British in the early days, after attaining supremacy in the country, began to require timber of various kinds for military purposes and other works they had no difficulty in obtaining all their needs, and so far as is known this may be said to have been the position of the population throughout the greater part of the country. The waste in exploitation was appalling, but the material was still in existence within reasonable distance of the markets, and no question of shortness in supply arose between the Home or Indian Governments. Nor did the matter apparently ever cross their minds, the forests being regarded as inexhaustible.

The position of the forests, therefore, towards the close of the eighteenth century is easily defined. Certain trees, the timber of which had a recognised value as articles for a valuable export timber trade, a trade which had existed in some cases for many centuries, had been proclaimed "royal trees" by the rulers of the territories in which they flourished. With these few exceptions the forests were free to all, although nominally they belonged to the ruler of the territory. This latter claim existed, with certain small exceptions of forest territory, throughout the country as a whole, and formed the basis upon which it was ultimately found possible to build up the Forestry Department under the British regime.

The forest area had been immensely reduced by fire and axe and by the almost universal practice of shifting cultivation, this reduction having reached a point at which it was

seriously jeopardising in parts the pursuits and business of the population, which was in the main an agricultural and pastoral one. For the unchecked destruction of the forests was having an adverse effect on the maintenance of the water supplies over considerable areas in some parts.

But the British of the period were unacquainted with the principles of forestry science. The reports on the forests in the neighbourhood of the parts of the country we first occupied were unanimous in regarding them as inexhaustible, so far as the materials that were required from them were concerned. The first decades of British occupation of India, therefore, witnessed no check, but rather an enhanced rate in the destruction of fine timber forests in these regions. And the destruction of the forests throughout the remainder, the greater bulk, of the country, continued on the lines which had been in force throughout the centuries.

CHAPTER IV

ON THE CHARACTER AND DISTRIBUTION OF THE FORESTS

THE distribution of the tree growth and of the chief types of forest in India, as also the size of the individual trees, varies in direct proportion to the amount of rainfall experienced in the different parts of the country. Rainfall is not, however, the sole factor regulating this distribution and change in type. Elevation also produces marked changes. In a country where every variety of climate exists, from the sub-Arctic or Alpine to the Tropic, sharp changes will of necessity make their appearance in different regions. Aspect also has a considerable influence on the character of the forests, accompanied, as it may be, by either sharp frosts or scorching winds. The overflow of the large rivers and percolation are responsible for a considerable variety in the type of the forest present in large tracts of the country. In areas where the rainfall is scanty, or almost wanting, as in the deserts of Rajputana, for instance, tree growth is absent, whilst in other regions the character of the forests is decided by their position on the seaboard or in the deltas of the great rivers, where the mangrove forests reign supreme.

Before proceeding to a consideration of the history of the forests it becomes necessary to give some brief description of the great differences in the main types of forest growth in the country. The following brief exposition is based on Ribbentrop's treatment of the subject in his *Forestry in British India* (1900). This treatment follows the lines adopted by Brandis in a paper read before the Geographical Section of the British Association at Brighton in 1872. The meteorological maps were, however, more accurate in 1900 than in 1872. Therefore Ribbentrop's subdivisions of the "zones" of forest growth are more detailed.

Gamble's *Manual of Indian Timbers* and Brandis' *Indian Trees* have also been consulted and made use of.¹

¹ This chapter was written before the publication of Professor R. S. Troup's *Sylviculture of Indian Trees* (1921). Professor Troup divides the

India may be divided into four climatic zones which exert a marked influence in the distribution of the forest types.

(1) *The Dry Zone.* An average rainfall of from 15 to 30 inches. This zone comprises the large oval plateau-like tract in which the Godaveri, Kistna and Cauvery have their sources. It extends from Nasik in the Bombay Presidency south-eastwards to below Bangalore, with an average breadth of 200 to 250 miles.

(2) *The Intermediate Zone.* An average rainfall of between 30 to 50 inches. This consists of a narrow strip situated to the west of the dry zone, but includes the whole of the tracts to the north, north-east and east of the latter as far as the Bay of Bengal.

(3) *The Moist Zone.* An average rainfall of 50 to 75 inches. This forms a narrow belt to the west of the intermediate zone along the eastern slopes of the Western Ghâts, and embracing also the seaboard of the southern portion of the Gulf of Cambay and the northern part of Travancore.

(4) *The Wet Zone.* An average rainfall of over 75 inches. This zone includes the remaining portion of the Ghâts lying to the westward, consisting of the western slopes with which the moisture-laden south-west monsoon currents first come into contact on their passage north-eastwards.

Curiously enough differences in latitude—the Indian Empire extends from the eighth to the thirty-fifth degree northern latitude—exert comparatively small changes in the forest flora. There are no such abrupt changes as exist in Europe, where the Alps sharply divide the northern and southern forest floras. A study of the India flora discloses the fact that certain species are characteristic of the southern part of the country, as, for example, the teak and *Xylia dolabriformis*, whereas others are representative of the north; but there are many others which occur throughout the length and breadth of the Empire. That no sharp changes or marked contrasts exist in the flora is attributable to the fact, which is equally true of the fauna, that the great Indian continent is completely isolated on the north by the great wall of the Himalaya and surrounded on the other sides by the sea.

types of forest in India and Burma, including the Andamans, into twelve regions, viz.: the W. Himalayan, the E. Himalayan, the Trans-Indus, the N.-W. dry region, the Gangetic Plain, the West Coast region, the Central Indian, the Deccan and Carnatic, Assam, Chittagong and Arakan, Burma, the Andamans.

From the forester's point of view India may be divided into seven zones, containing fairly distinct forest types of growth.

- | | |
|---------------------------|--|
| A. Evergreen Forest Zone. | Dependent on or due to the |
| B. Deciduous " | rainfall. |
| C. Dry " | Due to paucity of rainfall. |
| D. Alpine " | Due to elevation. |
| E. Riparian " | Lands subject to the overflow
of or percolation from rivers. |
| F. Tidal " | Subject to tidal influences. |
| G. Zone without Forests. | Due to absence of rain, exces-
sive inundation or eleva-
tion. |

Exceptions occur within these zones in which, owing to soil characteristics, forests of a different nature to the zone type exist or in which the areas may be treeless.

A. THE EVERGREEN FOREST ZONE

The Evergreen Zone may be subdivided into four distinct geographical regions : (1) The West Coast Region. (2) The Burma and Chittagong Region (including the Andamans). (3) The Carnatic Region, and (4) The Sub or Outer Himalayan Region. The growth in the Carnatic Region is influenced by the north-east monsoon, that of the other three by the south-west monsoon.

(1) *The West Coast Region.* This region covers the coast districts of the Konkan, Canara, Malabar, and Travancore, and extends over the western scarps of the mountainous ranges behind them in the Mahratta country, Coorg, the Nilgiris, Anaimalais, Cochin, and the Travancore Hills. The trees occupying the forests of this region mainly belong to the families *Anonaceæ*, *Guttiferae*, *Dipterocarpeæ*, *Anacardiaceæ*, *Myrtaceæ*, *Rubiaceæ*, *Lauraceæ* and *Euphorbiaceæ*.

In parts of this region dry areas exist with a growth not unlike that of the deciduous forests of Central India and with a good deal of teak. The greater part, however, consists of hill forests, the lower hill slopes being covered with evergreen forest growth of large trees such as *Dalbergia latifolia*, *Xylia*, *Artocarpus*, *Pterocarpus*, *Lagerstroemia*, *Terminalia*, *Vateria*, *Canarium*, *Cullenia*, *Polyalthia*, *Mesua*.

Higher up, and especially in the hill ranges of the Nilgiris, Anaimalais, Pulneys and Travancore mountains, these ever-

green forests merge into what are known as the "sholas," the principal vegetation consisting of *Eugenia*, *Michelia*, *Ilex*, *Hydnocarpus*, *Elaeocarpus*, *Ternstroemia*, *Gordonia*, *Symplocos*, rhododendrons and laurels, with an undergrowth of *Strobilanthes* and tree ferns, etc. In this region teak is the chief tree of export, followed by blackwood (*Dalbergia latifolia*). In the hill ranges plantations of exotic trees have been formed, chiefly of Australian *Eucalyptus* and *Acacia*, but also of various pines, cypress, etc., all of local importance for the provision of fuel. In the coast tract the Talipat palm is conspicuous, and in the Ghát Region are found *Bentinckia* and *Arenga Wightii*, with many canes and bamboos, such as *Teinostachyum Wightii*, *Oxytenanthera Thwaitesii*, and species of *Ochlandra* and *Arundinaria Wightiana* on the higher hills.

(2) *The Burmese Region.* This region covers the coast and the western mountain slopes of the Mergui, Tavoy, Amherst, Kyaukpyu and Arakan districts, broadening and contracting according to the formation of the mountain chains, and spreading into favourably situated moist side-valleys of the Tenasserim, Salween, Sittang, Irrawady and Attaran rivers. The region extends into Bengal, and occupies considerable areas in the coast districts of Chittagong.

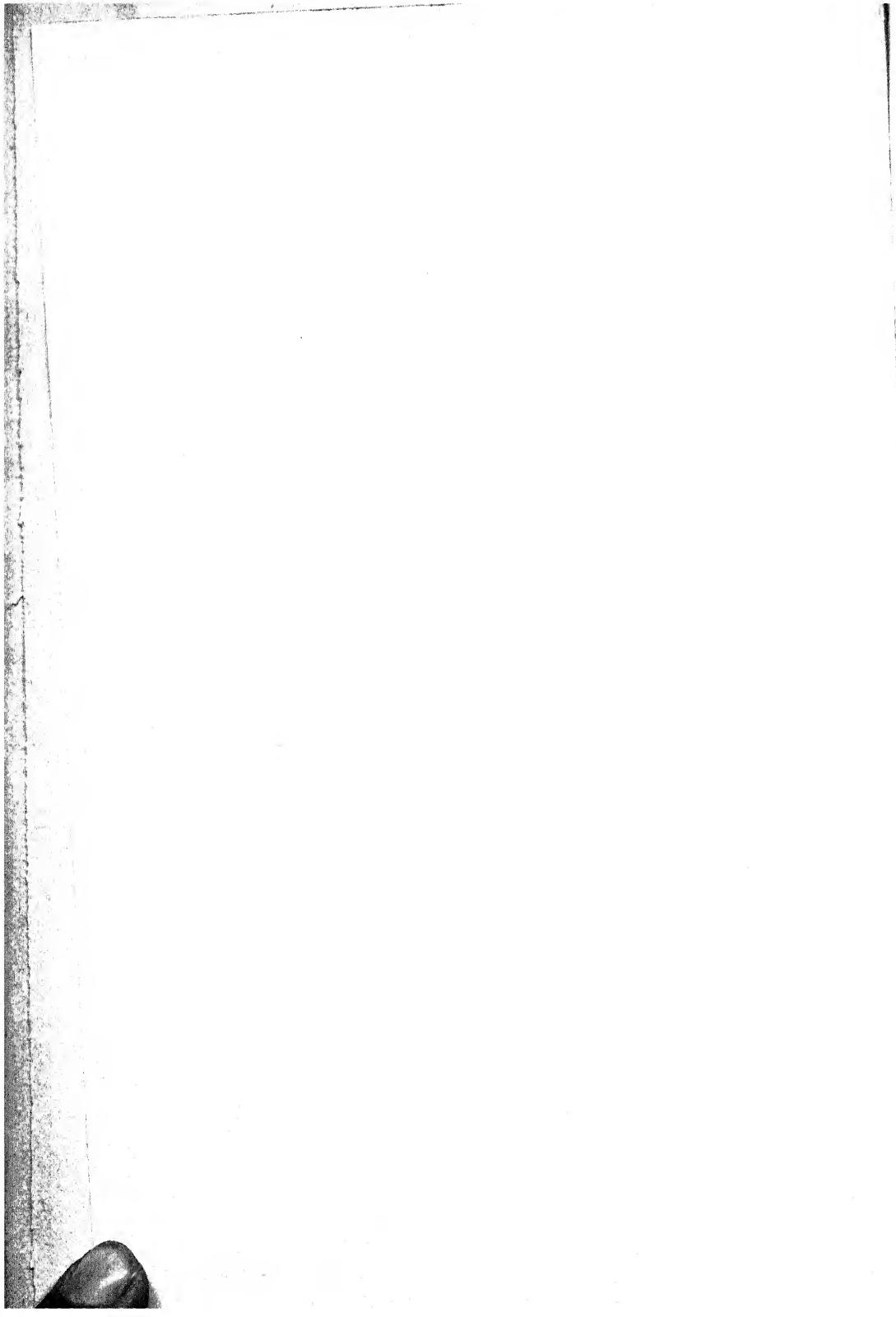
The variety of trees in these forests is very great, and the constituents of the forests vary considerably even in contiguous tracts. The height of the trees forming the upper canopy ranges from 150 to 200 feet, the tallest being such species as *Dipterocarpus turbinatus* and *alatus*; *Sterculia spicigera*, *fætida* and *campanulata*; *Tetrameles nudiflora*, *Parkia leio-phylla*, *Acrocarpus fraxinifolius*, *Albizzia Lebbek* and *stipulata*; *Xylia dolabriiformis*, and a few other species.

The above are leaf-shedding trees, which tower above the mass of evergreens. Of less lofty trees the variety is considerable, and include such species as *Mesua ferrea*, *Mitrophora vandæflora*, *Bursera serrata*, *Kurrimia robusta*, *Stereospermum fimbriatum*, *Vitex peduncularis*, *Adenanthera pavonina*, *Cedrela Toona*, *Lagerstroemia calyculata*, *villosa* and *tomentosa*; *Mangifera indica*, *Trewia nudiflora*; these species being associated with a large number of others. Of those which form a lower story under the shade of the loftier trees, a few may be mentioned, such as *Pterospermum*, *Garcinia*, *Xanthochymus*, *Cinnamomum*, *Tetranthera*, etc.

As a rule, tropical evergreen forests which grow on metamorphic rocks are richest in species, while those occurring on



MELOCANN *BAMBUSOIDES*, 6 YEARS OLD. KASSALONG RIVER, CHITTAGONG
HILL TRACTS
R. S. Pearson, "Indian Forester," Vol. XLVI



the sandstones and other sedimentary less-altered rocks are poorest in this respect.

The shrubby vegetation of these forests is densest along water-courses, in places which have been cleared of the taller trees, and along the outskirts of the forests, almost disappearing in the dark interior.

Climbing palms are numerous, such as *Nectocomiopsis paradoxus*, *Calamus latifolius*, and *longisetus*. Bamboos, such as *Dinochloa M' Clellandii*, *Gigantochloa macrostachya*, *Dendrocalamus longispathus* and *Brandisii*, *Bambusa polymorpha*, are also numerous. Several species of these bamboos frequently attain a height of 90 to 100 feet. Palms and screw-pines are found dispersed throughout these forests.

(3) *The Carnatic Region.* This is a different class of forest from the one above described. When in good condition, it presents a dense thicket of close-grown trees, few of any great size, but most of them giving hard valuable woods. More often, owing to careless cutting, it is reduced to a condition of thorny scrub. The area in which this class of forest is found begins at the Mahanadi and goes down almost the whole length of the eastern coast, the best forests being probably those of Nellore, Cuddapah, and North Arcot. Chief among the trees of this forest are *Mimusops hexandra*, *Diospyros Ebenum*, *Pterospermum*, *Eugenia*, *Memecylon*, *Pleurostylia*; while some few deciduous trees, like *Chloroxylon Swietenia* and *Soymida febrifuga*, occasionally occur. When in bad condition, thorny shrubs, such as *Randia*, *Canthium*, *Dichrostachys* and *Zizyphus*, are prominent; but when in good order, these forests are valuable sources of fuel and give some of the hardest woods of the country.

(4) *Sub-Himalayan Region.* This region covers the belt of low country bordering on the spurs of the eastern Sub-Himalayan range, entering deep into their valleys and covering the slopes of the lower spurs.

The number of species composing the forest is very great and the trees individually attain a great size, of which the more important are the following: *Schima Wallichii*, *Terninalia tomentosa* and *myriocarpa*; *Artocarpus Chaplasha*; *Cinnamomum glanduliferum*, *Echinocarpus sterculiaceus*, *Bombax malabaricum*, *Dillenia indica*, *Eugenia formosa* and *Pterospermum acerifolium*. On the lower hills occurs a *Magnolia*, also *Michelia champaca* and *Duabanga sonneratoides*. At still higher elevations are found *Castanopsis indica*, *Alnus*

nepalensis and *Bucklandia populnea*. This region runs into the Alpine Forest Zone (3) described later on.

The ground in these forests is usually covered with a dense growth of ferns, climbers and inferior shrubs, which together form a tangled mass, rendering it extremely difficult to penetrate into their interior. In the hilly portions a dense growth of bamboo (*Dendrocalamus*) occurs, while the valleys are filled with screw-pines and palms. Of the latter such species as *Wallichia disticha*, *Caryota urens*, *Areca gracilis* and *Phænix rupicola* are conspicuous.

B. THE DECIDUOUS FOREST ZONE

For Forestry purposes this zone may be divided into two chief regions : (1) The Central India Deciduous Region, (2) The Burma Deciduous Region.

(1) *The Central India Deciduous Region.* This region includes what is practically the type-forest of India. It extends from the southern slopes of the Punjab Himalaya, eastwards up the valley of Assam and southwards almost to Cape Comorin. It varies both in character and species in different parts of the great extent of country it covers, but its general characteristics and growth remain the same. Some species occur in it almost universally, such as *Terminalia tomentosa*, *Arjuna* (along streams), *belerica* and *Chebula*; *Lagerstroemia parviflora*, *Butea frondosa* and *Bombax*. Others are found in more or less local areas. *Anogeissus* does not extend to Northern Bengal; *Pterocarpus marsupium* and *Bassia latifolia* scarcely cross the Ganges northwards; while *Dillenia* and *Careya* are rare south of the Kistna. This deciduous forest type covers the plains country of the North-Western Provinces, the Terai, the Duars and Chota Nagpur, the hill tracts of Orissa and the Circars, the Central Provinces, Behar, Guzerat and Central India, Hyderabad and the East Mahratta country, the Nellary, Cuddapah and Mysore Hills, the hills of Coimbatore and Salem, the eastern slopes of the Nilgiris, Palnis (Pulneys) and parts of those of Tinnevelly, especially on slopes with a southern aspect. It contains several sub-regions characterised by their principal trees. These consist of (a) the region of Sâl (*Shorea robusta*), which follows the foot of the Himalaya from the Sutlej to the Borelli, and extends southwards nearly to the Godavari in the Circars and to Nagpur in the Central Provinces; (b) the region of Ironwood (*Xylia dolabriformis*) in the forests of the Circars from the Mahanadi

to the Kistna, extending westward into the Chanda district and Hyderabad ; (c) the region of Teak (*Tectona grandis*), which commences where the Sâl leaves off and extends southwards to the end, embracing in its general area (d) the region of Red Sanders (*Pterocarpus santalinus*) on the hills of Cuddapah and North Arcot, and (e) the region of Sandal (*Santalum album*) on the hill ranges of Bellary, Coimbatore and Salem and the northern slopes of the Nilgiris.

The sâl is the chief species of sub-region (a). It occupies two principal tracts in India. Gamble thus describes these tracts : "The first is a belt at the foot of the Himalaya and running into its valleys and up its lower hills to 3000 or 4000 feet, and exceptionally, as for instance at Lansdowne, to a still higher altitude. According to J. E. T. Aitchison ("Flora of Hoshiarpur," *Journ. Linn. Soc.*, 1868), the Purwain Range is the western limit. Brandis says it occurs in patches on the Bias. It is found in the Kangra Valley, and the regular continuous forest commences in the Umbâla Siwaliks, west of the Jumna, whence it passes through Dehra Dun, Saharanpur, Bijnor, Kumaon, Oudh, Gorakhpur, Nepal, the Darjeeling Terai, W. and E. Duars and up the Assam Valley, with an out-lier in the Garo Hills. The second is the Central Indian belt, and the sâl country begins on the Ganges near Rajmehal and passes through the Sonthal Parganas, Rewah, Chota Nagpur, the Central Provinces, Orissa and the Northern Circars, ending in the Palkonda Range of Vizagapatam and the forests of Jeypur.

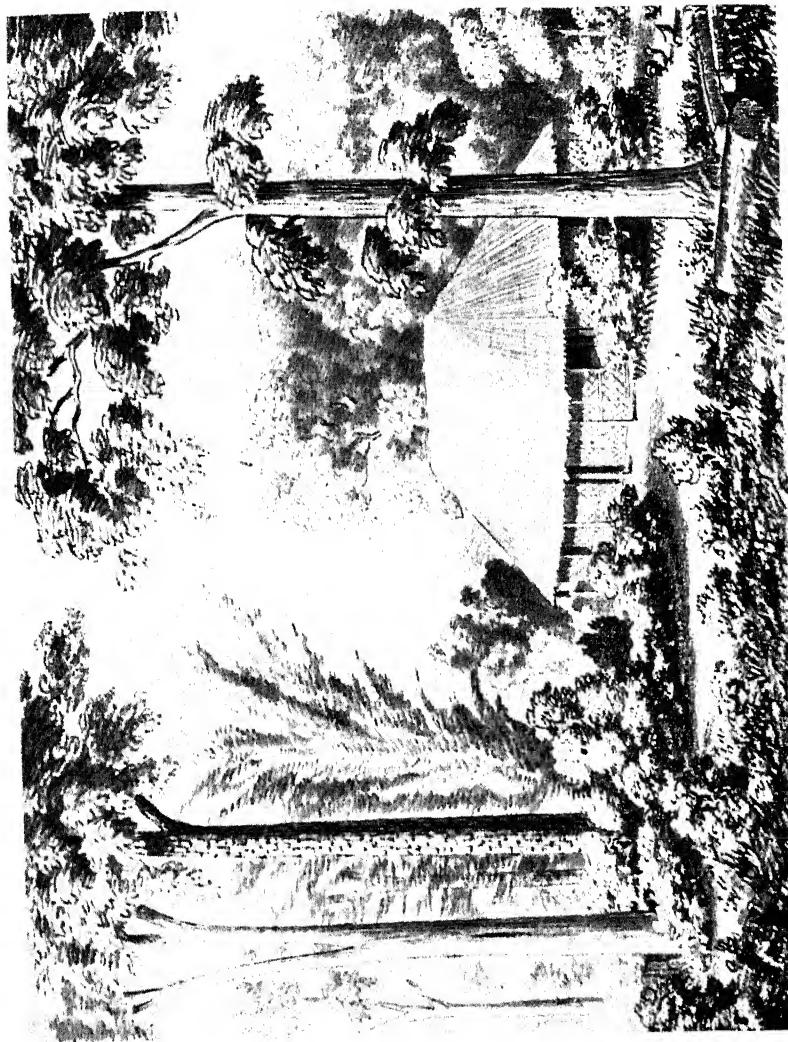
The most uniformly gregarious among the timber trees of India, the sâl, in the forests in which it occurs, is always the prevailing tree, greater in number of individuals than all the rest put together. Brandis (*Journ. Linn. Soc.*, XXXI, 6) says regarding it : "In a climate and on soil which suit it, it reigns supreme. The most suitable soil is either sandstone, as in many parts of Central India, or alternating beds of shingle and sand, such as are found at the foot of the Himalaya, or loam resting on gravel and sand."

For *Xylia dolabriformis* in sub-region (b) Gamble gives the distribution as "Eastern and Western Ghâts of South India in deciduous forest, extending north to Orissa and Bombay, but not beyond Chanda in the Central Provinces, often more or less gregarious as in S. Canara and Malabar and the Upper Godavari." Next to teak this tree is one of the principal trees of the Burma deciduous region.

The sub-region (c) forms the western or Indian tract occupied by the teak (*Tectona grandis*), which is practically the whole of the peninsula of India, the eastern tract being the Burmese. Gamble gives the following distribution of this tree: "The Indian Region (of the teak) has for its northern limit the Rivers Nerbudda and Mahanadi, but here and there it may occasionally be found north of this line, as in Jhansi and Banda, while south of it it scarcely occurs in Orissa or the Circars. It is found in deciduous forests, but is not gregarious; and the localities where the most important forests are found are (1) Chanda District, Central Provinces; (2) North Canara; (3) Wynaad, especially the tracts known as Benné and Mudumalai; (4) the Anaimalai Hills; (5) Travancore. There are also considerable extents of teak forest in other parts of the Central Provinces, in Berar and Bombay; on both sides of the Godavari in Bhadrachalam, Rampa and Yernagudem; in the Nallamalai Hills of Kurnool and Cuddapah; in South Arcot and in Mysore. But teak may be found sporadically in places in forests throughout the Indian Region, and even in such very dry, apparently barren, rocky hills as those of Western Kurnool and Bellary, patches of stunted more or less gregarious teak are not uncommon."

Chief among other trees characteristic of these forests are the *Terminalias*, *Lagerstroemia parviflora*, *Anogeissus latifolia*, *Dillenia indica*, *Eugenia jambolana*, *Ougeinia dalbergioides*, *Soymida febrifuga*, *Chloroxylon Swietenia*, *Pterocarpus marsupium*, *Diospyros melanoxylon*, *Bassia latifolia*, *Dalbergias*, *Albizzias*, *Bombax*, *Wrightia*, *Garuga*, *Bursera*, *Holarrhena*, and there are many others, while the small male Bamboo (*Dendrocalamus strictus*) is almost universally characteristic. In this same region occur also the sissoo (*Dalbergia Sissoo*), gregarious along streams in the region between the Himalaya and the Ganges, and the *Acacia Catechu*, the khair or catch tree, which, with other species of *Acacia*, such as *summa*, and *leucophlaea*, is everywhere indicative of a somewhat poor sandy soil. Forming part of this same region, too, is the great Regada or "black-cotton country," where the *Acacia arabica* is the common tree, coming up wherever the land lies fallow for a while, and accompanied sometimes by *Albizia Lebbek*, *Melia indica*, *Poinciana elata* and *Balanites Roxburghii*.

(2) *The Burmese deciduous forests.* These are the typical forests of the drier parts of Burma, and are unquestionably

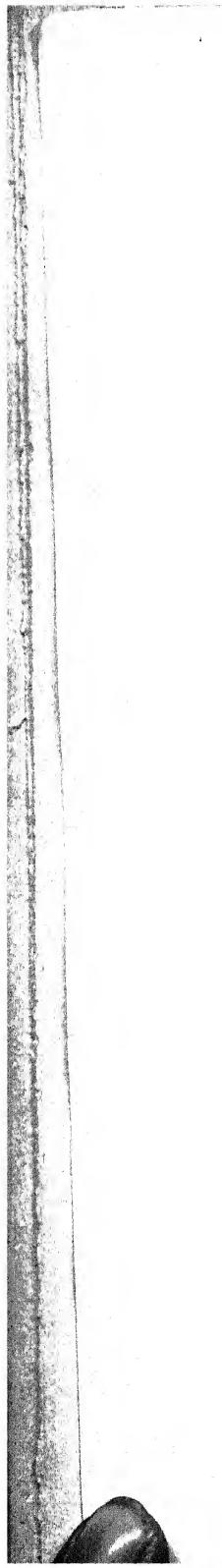


TEAK

PENTAPTERA

TEAK

THE FOREST BUNGALOW, ANAMALAI FORESTS
From Cleghorn's "Forests and Gardens of South India."



the most important to the Forester. They occupy that portion of the country, both in plains and hills, in which the climate is drier and the rainfall is less. These forests can be subdivided into several sections, each characterised by the presence, or absence from it, of certain typical species. It will be sufficient to state here that, broadly speaking, the deciduous forests of Burma differ but little from the similar class of forests occurring in the peninsular and extra-peninsular tracts of British India. The most characteristic and important species of trees found in the Burma deciduous forests are the teak, here attaining large dimensions, and *Xylia dolabriformis* (Pyingado). This forms the eastern tract of the teak. Gamble gives the following distribution : " In the Burmese Region, teak is chiefly found in what are called by Kurz the 'upper mixed forests,' which occupy the parallel ranges of (1) the Arakan Yoma, eastern slope ; (2) the Pegu Yoma ; and (3) the Martaban Hills and the hills which contain these ranges northwards. The northern limit, according to J. W. Oliver, is about Myitkyina and Kamaing, in lat. $25^{\circ} 30'$, though there it is mostly of stunted growth." Of the *Xylia*, or pyingado, Gamble says it is found in "all deciduous forests in Burma and Arakan, 'as far north as 24° north lat. in the Irrawaddy Valley'" (J. W. Oliver).

"After teak, *Pyingado* has been the most important timber tree of Burma, and the chief of the associates of teak in the forests. On good and suitable soil it reaches a large size, 90 to 100 feet in height with 9 to 12 feet in girth ; on poor soil it remains a comparatively small tree, and the bole becomes short and poor."

Associated with the above two trees are *Eugenia Jambolana*, *Bombax insigne*, *Sterculia versicolor*, *fetida* and *villosa*; *Pterospermum semisagittatum*, *Garuga pinnata*, *Bursera serrata*, *Semecarpus*, *Spondias mangifera*, *Terminalia*, *Anogeissus acuminata*, *Lagerstroemia Flos-Reginæ*, *Briedelia retusa*, *Millettia Brandisiana*, *Cordia grandis*, *Gmelina arborea*, *Dalbergia Kurzii*, *Nauclea cordifolia*, *rotundifolia*, and other species.

On the lower ground occur such species as *Vitex leucoxylon*, *Bombax malabaricum*, *Kydia calycina*, *Dolichandrone stipulata*, *Heterophragma adenophyllum*; several *Albizzias*, such as *A. odoratissima* and *procera*; *Acacia Catechu*, *Ficus*, *Randia*, *Gardenia*, *Bauhinia*, *Grewia*, *Schrebera swietenioides*, and others. The real Padauk tree of Burma (*Pterocarpus macrocarpus*) and

P. indicus, though occasionally found in evergreen forests, are in their natural habitat in this class of forests in Burma, as is also the case with *P. dalbergioides* in the Andamans. In the latter locality this tree attains very large dimensions.¹

Herbage and shrubs, though not dense, are more conspicuous than in the deciduous forests of the Central India type. Bamboos prevail, of such species as *Dendrocalamus strictus* and *longispathus*, *Bambusa Tulda* and *polymorpha*; and on the lower ground such species as *Cephalostachyum pergracile*, *Gigantochloa albociliata* and *Bambusa arundinacea* occur frequently in abundance. Climbing shrubs are numerous in all the moister tracts, such species as *Butea superba* and *parviflora*, *Entada scandens*, several species of *Vitis*, *Millettia auriculata*, *Mezoneurum cucullatum*, being conspicuous. A few palms occur, but are much reduced in size.

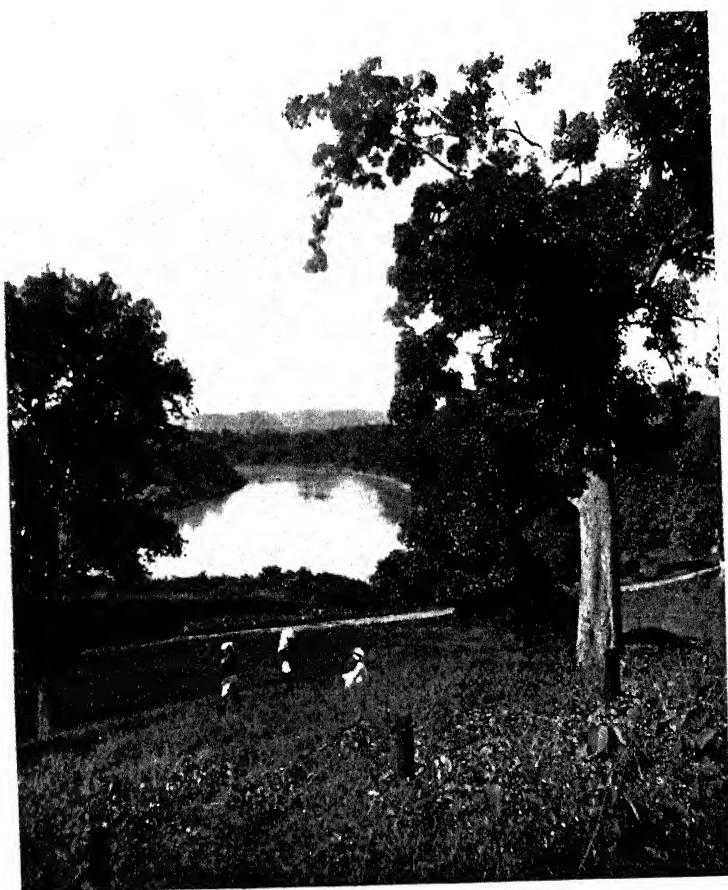
An important though less valuable section of these forests are the Eng or wood-oil bearing forests, composed to a great extent of several species of *Dipterocarpus*, the principal of which is *tuberculatus*. These forests, in which *Pentaclea suavis*, *Dillenia pulcherrima* and *Shorea obtusa* form quite a feature, and which frequently jut out into the evergreen forest zone around them, may perhaps owe their origin to the condition of the soil on which they are found.

C. THE DRY FOREST ZONE

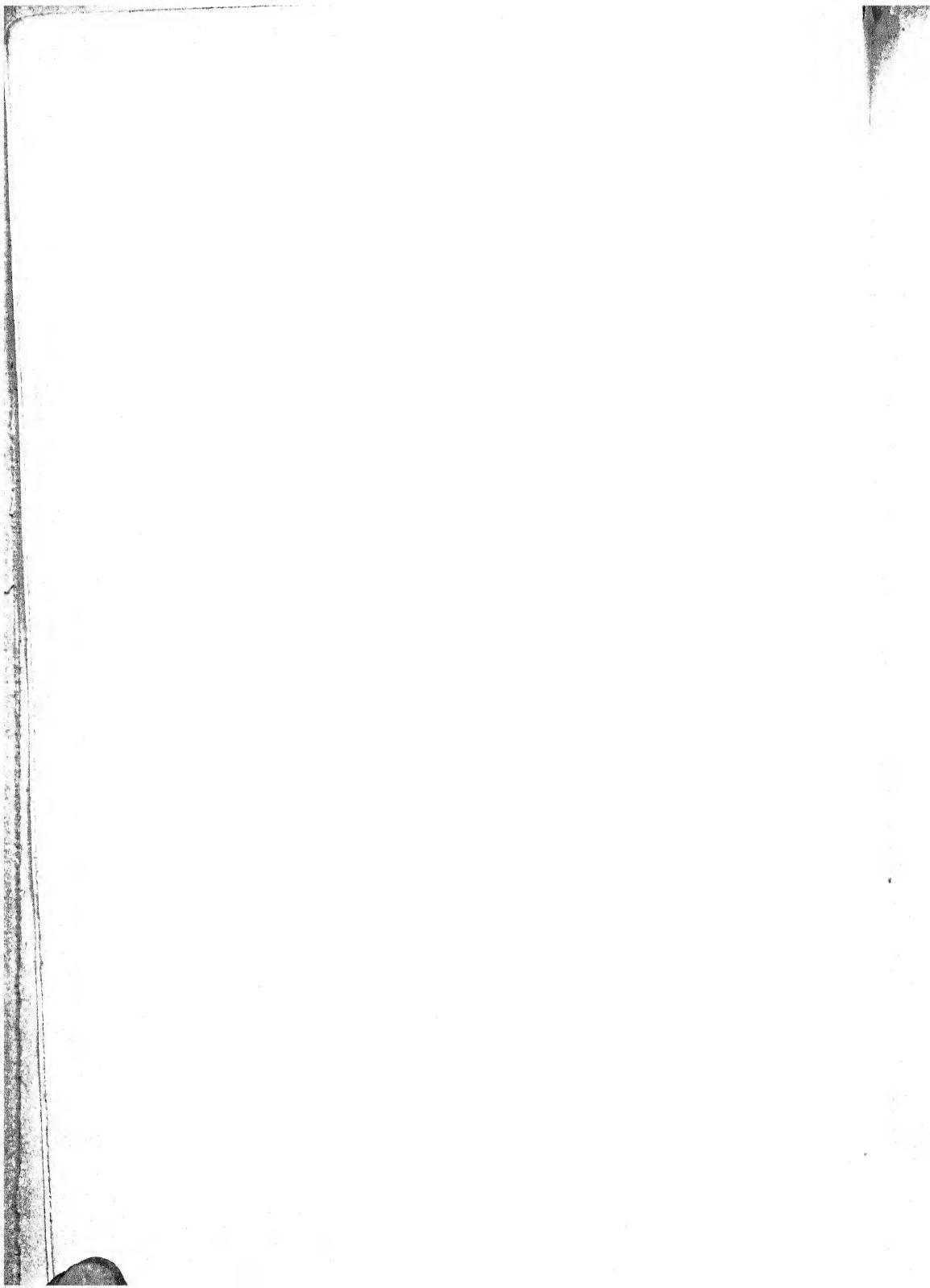
The dry forest zone occupies two separate regions : (1) Rajputana, (2) The Punjab.

(1) *The Rajputana Region.* Owing to the limited rainfall the forest flora of Rajputana is not a rich one, nor are the trees themselves much developed. The province is divided by the

¹ Professor Troup divides the Andamans forests into five main types as follows: (a) Mangrove forests of the usual type already described; (b) Beach forests, narrow strips along raised beaches of sand, shells and coral above high-tide limits. The commoner trees and shrubs are species of *Mimosa*, *Calophyllum*, *Terminalia*, *Erythrina*, *Pongamia*, *Heritiera*, *Odina*, etc.; (c) Evergreen forests, confined usually to the ridges and upper slopes of hills and characterised by several species of *Dipterocarpus*, *Hoppea*, *Planchnia*, *Artocarpus*, *Mesua*, *Myristica*, *Albizia*, *Diospyros*, *Podocarpus*, with a dense undergrowth of canes and other climbers; (d) Semi-evergreen and deciduous forests, occupying lower slopes and undulating ground between the evergreen and mangrove or beach forests. The chief timber tree here is the padauk (*Pterocarpus dalbergioides*), other genera being *Lagerstroemia*, *Terminalia*, *Albizia*, *Bombax*, *Odina*, *Stereulia*, *Careya*, and others; (e) The diluvial forests occurring on diluvial deposits situated between the mangrove forests and the hills. Species of both the evergreen and semi-evergreen forests are found here of the genera already given above.



VIEW FROM RUNGAMATTI, CHITTAGONG HILL TRACTS. A MUTILATED
GURJUN-OIL TREE (*DIPTEROCARPUS TURBINATUS*) ON RIGHT



Aravalli range of hills into two unequal parts—the part eastward of the range lying in the basin of the Chambal River, and that lying to the westward in the basin of the Indus. The country lying to the east of the range is more or less hilly, and has a climate and forest vegetation somewhat resembling those of Central India and the drier part of the United Provinces. Where not actually hilly, the surface is undulating. To the westward of the central range the country is much flatter and drier, and, as the Sind and Punjab frontiers are approached, it passes into actual desert.

The forests of Rajputana are in the main composed of the following species, none of them attaining their full development. Among the largest of the trees may be mentioned *Bombax malabaricum*; among the smaller trees are *Prosopis spicigera*, *Sterculia urens*, *Semecarpus Anacardium*; *Acacia leucophloea* and *Catechu*; *Anogeissus latifolia* and *pendula*; *Dichrostachys cinerea*, *Cordia Rothii* and *Myxa*; *Phyllanthus emblica*, *Erythrina suberosa*, *Bauhinia variegata*, *Gmelina arborea*, *Boswellia thurifera*, *Butea frondosa*, *Terminalia tomentosa* and *Arjuna*. Climbing plants and shrubs are numerous; among the former are *Cocculus villosus* and *Leæba*; *Celastrus paniculata*, *Vitis latifolia*; among the latter are *Mimosa rubicaulis*, *Capparis aphylla*, *spinosa*, *horrida* and *sepiaria*; *Zizyphus nummularia* and *xylopyra*; several *Grewias*, such as *G. populifolia*, *pilosa*, *villosa* and *salvifolia*; *Celastrus senegalensis*, *Buchanania latifolia* and *Diospyros montana* are small trees.

As the western border of the province is approached, the forest vegetation passes into desert forms, of which the more important are *Prosopis spicigera*, *Salvadora persica* and *Acacia Senegal*.

(2) *The Punjab Region.* The species of trees found in this zone are still fewer, owing doubtless to the fact that the monsoon rains are still lighter than in Rajputana; and this is the case more especially in the southern part of the province, which contains the dry forest region. The chief representative species are *Acacia arabica*, *modesta*, *leucophloea*; *Butea frondosa*, *Prosopis spicigera*, *Tamarix articulata* and *Salvadora persica*. *Dalbergia Sissoo*, *Albizzia procera*, and others are found where the water is near the surface. These forests become, towards the hills, richer in species and gradually blend with the deciduous forests and the forests characteristic of the Western Himalaya. On the other side, they disappear in the deserts

of Sind and Bahawalpur, where only the river banks are fringed with tree vegetation.

D. THE ALPINE FOREST ZONE

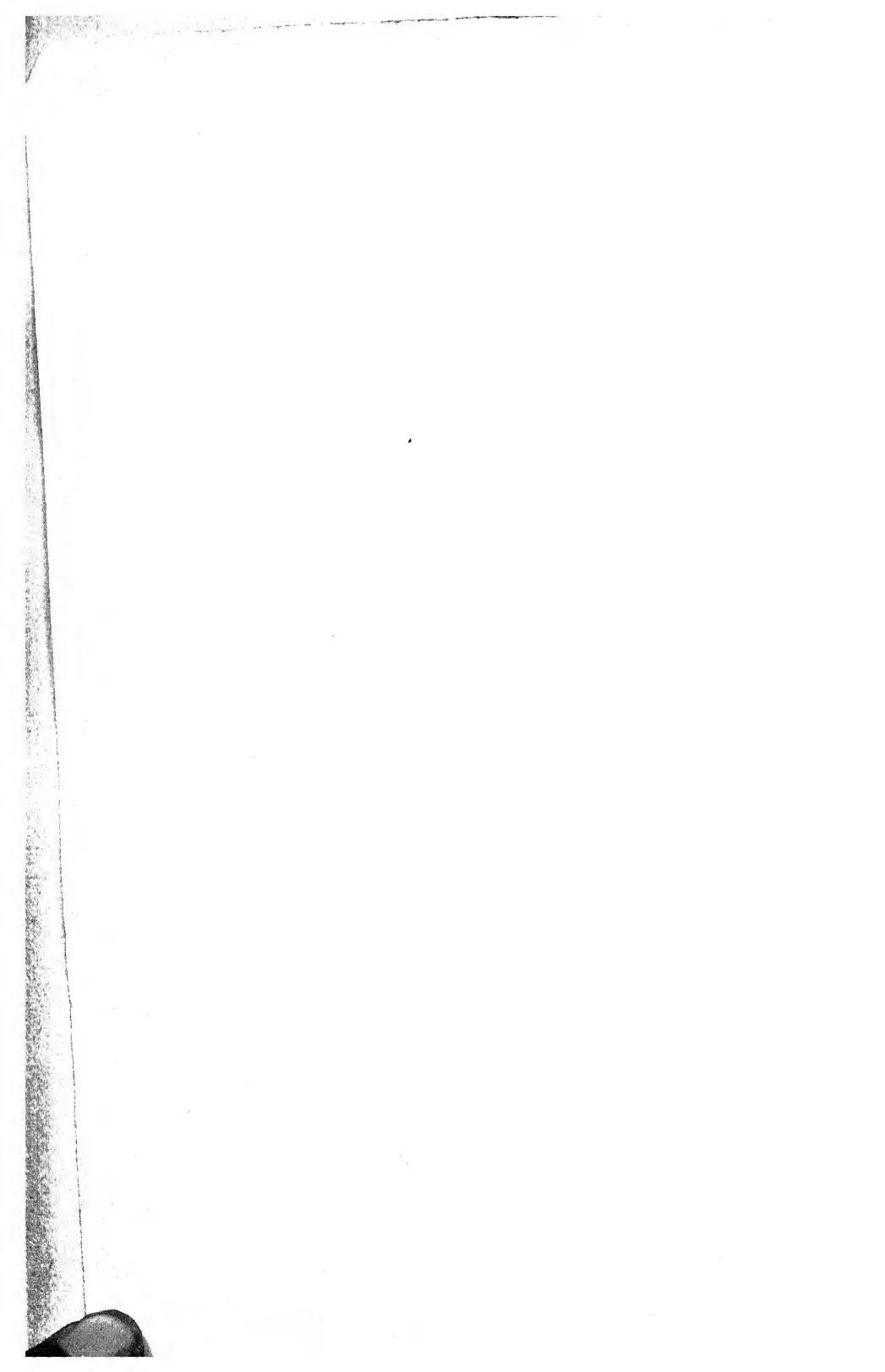
The forests of this zone may be divided into four chief regions, according to their position on the North-Western, Northern or North-Eastern Frontier of India. These regions consist of the Alpine forests of (1) the Western Himalaya, (2) Afghanistan and Baluchistan, (3) the Eastern Himalaya and (4) Burma.

(1) *The Alpine Forests of the Western Himalayan Region.* This region extends from the outer hills, where the forest is characteristic of the deciduous forest zone up into the great mountains of the Himalayan chain, rising far above tree-level to over 24,000 feet and the regions of perpetual snow. In this great mountain mass deep gorges and valleys of varying width, length and elevation occur, the physical features in consequence being extraordinarily varied. On the outer hills and ranges the monsoon rainfall is heavy, but only occurs for a few months; consequently the flora does not obtain the same benefit from it as would be the case if it were more uniformly distributed. The monsoon rainfall decreases in amount as it penetrates into the interior, each successive barrier they strike upon relieving the rain clouds of a part of their moisture, until beyond the snow-line all that is left of the monsoon rains is represented by a short period of misty weather. The area over which this heavy rainfall is distributed also varies, being broadest as it proceeds eastwards and decreasing westwards where it does not extend beyond Dalhousie. As would be expected the vegetation, and especially the herbaceous portion, changes with the climate and degree of moisture, being luxuriant in Nepal and disappearing to a great extent on the arid Afghan hills. The tree growth also presents some marked changes. Of the former, *Zingiberaceæ*, *Orchideæ*, *Aroideæ* and *Begoniæ* are very characteristic of the vegetation of the Eastern Himalaya. They occur in small numbers in Kumaun, diminishing to the westward, and are scarcely to be found beyond the Sutlej, the climate here being too dry for them. The converse is to be found in the genus *Artemisia*, which is abundant in the Western Himalaya, whereas only two out of the twenty-five Indian species occur in the Eastern mountains.

Trees and shrub growth present changes with the decrease

Chilgoza (Pinus gerardiana) FOREST AT SUNGARH, WITH NATURAL REGENERATION IN FOREGROUND.
NORTH ZHOB





of moisture from the outer to the inner Himalaya, *Quercus incana* and *Rhododendron arboreum* being characteristic of the outer, and *Pinus Gerardiana* (which commences to appear on the north side of Wangtu on the Hindustan-Tibet Road, for instance) and *Ephedra*, of the inner mountains. West of the Ravi the change from the outer flora type to that of the inner is more rapid, owing to the lesser rainfall, the *Quercus incana*, etc., being only found on the outermost range. In the more elevated temperate areas trees and shrubs of European genera and species occur, such as yew, juniper, walnut, box, ivy and mistletoe.

Four conifers are particularly characteristic of the region, viz. Deodar (*Cedrus deodara*), *P. Gerardiana*, the Cypress (*C. torulosa*) and the Juniper (*J. communis*). These only extend eastwards for a short distance into Nepal and the Eastern Himalaya. The deodar does not extend eastwards of the west of Nepal; its habitat is from 4000 feet (in the Punjab) up to 10,000 feet, and it is found even higher. In Kumaun its minimum elevation is about 7000 feet. Gamble describes the distribution of the deodar as follows:—

"The deodar is a gregarious tree forming fine forests in the valleys of the Punjab and Kashmir, as well as in those of the Tons, Jumna and Bhagirathi, ending up in the watershed of the Alaknanda. The forests are rarely of pure deodar, though exceptions are met with occasionally and usually in the form of sacred groves ; but more commonly the deodar is associated with the spruce and blue pine and the three oaks, *Kharshu*, *moru* and *ban*, in their various zones. Sometimes the silver fir (*Abies Pindrow*) accompanies it, but more rarely ; the cypress in its favourite localities joins it ; and the yew is often found under it, and at low elevations it mixes with the long-leaved pine (*P. longifolia*). A variety of other broad-leaved trees are also found associated with it."

The deodar has for long formed one of the most valuable timbers of the region, and the accessible forests were heavily cut before systematic forest conservation was introduced into Northern India. The *Pinus Gerardiana*, with a beautiful silvery bark, is a native of Afghanistan and of the drier valleys of the Himalaya as far east as the Sutlej. *Cupressus torulosa* is more sparingly distributed throughout the region, being usually found in clumps and patches on precipitous limestone rocks. The juniper is found in all the drier parts of the mountains from Afghanistan to Kumaun.

As has been said the outer hills up to about 3000 feet, or even higher, are occupied by a forest similar in character to that of the deciduous forest zone, the type found in the neighbouring Dun and Siwaliks. The sâl is the principal species of this forest, accompanied by *Terminalia tomentosa* and *Chebula*, *Adina cordifolia*, *Anogeissus latifolia* and *Ougeinia dalbergioides*; whilst *Dalbergia Sissoo* and *Acacia Catechu* occupy the silt deposits on the riverain terraces and banks and on the islands in the beds of the rivers, the latter species being also found scattered on the hill-sides. *Pinus longifolia* makes its appearance, at first singly or in clumps, in the upper elevations of the sâl, *Buchanania latifolia*, *Bauhinias*, *Ougeinia dalbergioides*, etc., forest. Higher up it appears in compact blocks, and where the sâl belt is left behind it forms extensive, often pure, forests on the hot and often stony hill-sides. When in mixture the species occurring are *Boehmeria rugulosa*, *Bauhinia retusa*, *Engelhardtia Colebrookiana* and species of *Ficus*. Above this, between 4000 and 6000 feet, a vegetation characteristic of temperate regions clothes the mountains. The commonest trees are *Quercus incana*, *Rhododendron arboreum* and *Pieris ovalifolia*; all of these occur throughout the Western Himalaya; but to the westward they are restricted within gradually narrower limits, and in the extreme west are found only in moist and shady localities, whereas in Kumaun and Garhwal they are most abundant on the drier and hotter slopes. None of these species occur in Kashmir. In the valleys and ravines the forest is usually very different, containing such species as *Quercus glauca*, *Celtis*, *Alnus*, *Aesculus*, *Populus ciliata*, *Ulmus Wallichiana*, *Betula alnooides*, *Carpinus viminea*, several maples and others. Between 6000 and 8000 feet is the chief zone of the deodar and the blue pine, as well as of the cypress; whilst above 7000 feet *Quercus dilatata* (moru) generally supersedes *Quercus incana* (ban), and small box (*Buxus sempervirens*) forests occur in damp valleys, especially on limestone. Between 8000 and 11,000 feet the principal trees are the Himalayan Spruce (*Picea morinda*), the Himalayan Silver Firs (*Abies webbiana* and *A. Pindrow*), the former from 10-14,000 feet, the latter from 7-9000 feet or a little above, and a third Oak, the Kharshu (*Quercus semecarpifolia*); whilst small Bamboos, with numerous *Strobilanthes* and Balsams, are conspicuous features of the under-growth. One of the last trees met with on ascending to 12,000 feet is a Birch (*Betula utilis*), accompanied by a tangled

undergrowth of a straggling shrubby Rhododendron (*Rhododendron Anthopogon*). Above this again is the Juniper, whilst close to the snow-line all trees and shrubs have disappeared, their places being occupied by numerous Alpine plants, such as gentians and primroses, with mosses and other cryptogams.

(2) *The Alpine Forests of the Afghanistan and Baluchistan Region.* The characteristics of the Western Himalayan forests persist in this region as far south as the Kurram Valley. The conifers consist of the Deodar, *Pinus Gerardiana*, the Blue Pine (*Pinus excelsa*), the Spruce, Silver Fir and *Juniperus excelsa*; the Oaks are restricted to *Q. ilex* and *semecarpifolia*, occurring with *Prunus Padus* and a species of *Rhus*. At the upper elevations the birch is replaced by thickets of dwarfed *Juniperus communis*. The undergrowth consists of *Rhododendron campanulatum*, *Viburnum*, *Syringa Emodi* and *persica*, *Crataegus Oxyacantha*, *Cotoneaster bacillaris*, wild roses and species of *Ribes*, etc. South of the Kurram the forest becomes poorer in character, filling high side valleys, the outer hills becoming more and more barren until Baluchistan is reached. The chief trees of Baluchistan proper with the tributaries of the Harnai and the Bolan are the *Juniperus macropoda*, which forms forests, and the olive, which is seen dotted over the barren hills. In favourable situations clumps or isolated individuals of the following are found: *Pistacia Khinjuk*, *Berberis*, *Fraxinus xanthoxyloides* and *Crataegus Oxyacantha*. In North Zhob the *Pinus Gerardiana* appears in small blocks of forest, as at Shinghar, Spiraghlar, etc., areas which the author has personally visited. In this region the tribesmen attach a high value to the edible seed of this pine which they collect and sell.

(3) *The Alpine Forests of the Eastern Himalayan Region.* The higher forests of this region consist of the conifers, Silver Fir, *Abies Webbiana*, the Spruce, Larch (*Larix Griffithii*), which is only found in the inner ranges, *Juniperus recurva* and the Hemlock Spruce (*Tsuga Brunoniania*). According to Duthie the hemlock spruce extends as far west as the Kali Valley in Kumaun, and Webber mentions it in his exploration of the forests of Kumaun in 1864. In British Sikkim, in the Eastern Himalayan Region, Gamble says it is found in the Siri Valley (and the Author saw it himself when in charge of the Tista Division in this region), where it grows mixed with or just below the silver fir and associated with yew, oaks, especially *Q. pachyphylla*, rhododendrons (chiefly *R. grande*, *Falconeri* and *barbatum*) and the Maling bamboo (*Arundinaria*

racemosa). It is a fine tree growing to as much as 120 feet in height, with a stately blunt pyramidal crown with branches spreading like the cedar, but drooping gracefully on all sides. It grows up at about 10,000 feet. Below the conifers come the rhododendrons, which form gregarious forests, the two tree species being *R. arboreum* and *R. grande*. The other rhododendrons are small trees or epiphytic shrubs, such as *R. Dalhousiae*, *Edgeworthii*, and the species already mentioned above. Associated with the rhododendrons are *Pieris ovalifolia*, *Buddleia Colvillei*, *Hydrangea altissima* and birches and maples. The oaks and chestnuts begin to appear at the lower elevations occupied by the rhododendrons (8000 feet being about their minimum elevation) and occupy a belt of roughly between 6000 and 8000 feet. The Oaks consist chiefly of *Q. lamellosa*, and *glaucia* and the Chestnut (*Castanopsis Hystrix*) ; lower down Magnolias, such as *Magnolia Campbellii* and others, *Michelia excelsa*, *lanuginosa* and *Cathcartii*, with large maples, laurels and species of *Echinocarpus*, *Bucklandia*, *Elaeocarpus*, *Machilus*, *Phæbe* and *Nyssa* and several species of small bamboos, tree ferns and canes are met with ; also climbers, such as *Thunbergia* and others. conspicuous owing to their bright-coloured flowers. Still lower the forest changes, large trees of *Cedrela*, *Terminalia*, *Duabanga*, *Canarium*, etc., making their appearance with palms of the genera *Caryota*, *Livistona*, *Phænix*, *Didymosperma* and the large screw pine, *Pandanus furcatus*. This type drops down into the sâl forest with its associated species, which is characteristic of the deciduous forest zone. The Tista and Rungeet Valleys exhibit the character of this zone as it appears in the foot-hills of the Eastern Himalaya à merveille, and shows the differences existing in the zone due to the heavier rainfall and damper heat of the eastern foot-hills.

(4) *The Alpine Forests of Burma Region.* The Burmese tropical evergreen forests give place at elevations of from 3000 to 3500 feet to trees more characteristic of temperate climates, the development owing to the dampness being very great. Oaks, Chestnuts (*Castanopsis tribuloides*), with other cupuliferous species, *Ternstroemia japonica*, *Bucklandia populnea*, species of *Eugenia*, with temperate *Laurineæ*, *Ostodes paniculata*, *Podocarpus*, etc. Perhaps the most distinctive feature of the region are the pines. At the higher levels they form either pure or nearly pure forests, whilst

lower down they are mixed with broad-leaved species such as Eng. The chief pine is the *Pinus Khasya*, which occupies the hilly parts of Upper Ava and Martaban. In Upper Tenasserim a second pine appears growing at a lower elevation, the *Pinus Merkusii*, occurring chiefly on the sandstone hills of the Thaungyin in Upper Tenasserim.

E. THE RIVARIAN FOREST ZONE

The types of forest found in this zone are almost invariably different from those of the surrounding forests, although they often present similar characteristics to the forests of the moister regions. The riparian forests owe their special attributes to the water the areas they occupy receive from the periodical overflow of rivers, or to direct percolation from rivers or considerable sheets of inland waters.. The forest vegetation resulting is usually different from that existing on adjacent areas beyond the reach of this overflow water. The individual areas occupied by this vegetation are not necessarily of great extent, but collectively they form a not inconsiderable part of the forest area of India. The character of this riparian forest varies according to its geographical position, but two main types of this class of forest may be given as characteristic of the zone: the first, the forests of the Lower Indus in the Sind desert; the second, the swamp forests of Burma.

The riparian forests in the rainless tracts of Sind are represented by mere fringes of tree vegetation on the river banks, where the rise of the Indus causes the inundation of large riparian areas during the hottest months. Large, valuable and quick-growing *Acacia arabica* forests are the result of these inundations, covering extensive areas of the low-lying alluvium. *Tamarix gallica* forests fringe the banks of all permanent rivers in the Sind-Punjab zone, interspersed with *Populus euphratica*, *Dalbergia Sissoo* and *Acacia arabica* which, even when no inundations take place, are nourished by perennial percolation from the streams. These areas are in the northwest of India known as "sailaba," and are easy of afforestation in spite of the high grasses (*Saccharum Sara* and *Munja*) which frequently cover them.

The forest trees which are found to disappear as the banks of the stream are left, are the *Dalbergia Sissoo* and Poplar. *Acacia arabica* follows next and *Tamarix dioica* takes the place

of the smaller *gallica*. Further on, as the stratum of moisture is more remote from the surface, *Prosopis spicigera* and *Salvadora persica* enter into the composition of the forest. *Capparis aphylla* soon after appears; gradually the forest gets more open, the *Salvadora* and *Capparis* more bush-like, and, when even the long roots of these desert trees cannot reach down to the water-level, the last representatives of forest vegetation disappear on the borders of the desert.

The swamp forests in Burma are situated on the banks of the rivers, which at a considerable distance from the sea form numerous branches, and especially during the rains are entirely free of brackishness, and they are also found on the shores of backwaters and lakes. The soil in these forests is more or less muddy throughout the greater part of the year; during the rains they are inundated, frequently to a considerable depth. The vegetation forms, as in the evergreen forests, three to four distinct strata; the upper canopy consists of trees, such as *Anogeissus acuminata*, *Mangifera longipes*, *Xanthophyllum glaucum*, which, however, is only 70 to 80 feet high. The second stratum is formed by smaller trees and contains several species of *Eugenia*, *Elæocarpus* (with a fruit which is pickled like an olive) and *Symplocos*. *Cassia Fistula* and numerous other species of interest to the botanist represent the third stratum. Amongst the shrubs are found *Grewia sinuata*, a species of *Combretum* and of *Gardenia* and many others. The herbage is very scanty and of no special importance; but climbers are plentiful, and in places render the forest almost impenetrable. The most common species are *Jasminum scandens*, *Gmelina villosa*, *Acacia pennata*, etc.

F. THE TIDAL FOREST ZONE

The tidal forest zone, as its designation implies, comprises the forests situated on the alluvial lands on the sea coast and its neighbourhood and those growing on the deltas of the larger rivers and up their banks as far as the tide flows. The species existing in these forests are dependent for their growth on the salt water reaching them. Along the sea face are the mangrove forests, consisting principally of *Rhizophoreæ*, such as *Rhizophora mucronata* and *conjugata*; *Ceriops Roxburghiana*, *Kandelia Rheedii*, *Bruguiera parviflora*, *Sonneratia apetala*, *acida* and *Griffithii*, *Ægiceras majus* and *Carapa moluccensis*.

Further inland, where the land is inundated only during

the spring tides, the mangrove forests pass into tidal forests, in which the above-named species become more subordinate ; while *Sonneratia apetala* and *Avicennia officinalis* prevail, associated with *Hibiscus tiliaceus*, *Thespesia populnea*, *Heritiera littoralis* and *minor*; *Pongamia glabra*, *Excoecaria Agallocha*, *Phœnix paludosa* and several other less conspicuous trees. *Heritiera minor* (the sundri tree of the Sundarbans) is the most common and most valuable tree in these forests. Shrubs, such as the following, are much developed : *Acanthus ilicifolius*, *Clerodendron inerme*, *Pluchea indica*, *Glochidion multiloculare* and *Ægialitis rotundifolia* mixed with climbers, such as *Derris scandens*, *uliginosa* and *sinuata*, *Acanthus* and others. *Nipa fruticans* and *Pandanus faétidus* locally form dense thickets.

G. ZONE WITHOUT FORESTS

This zone is not characteristic of one particular region of India, but, from quite different causes, occurs in various parts of the country. It comprises the mountains above the line of vegetation or tree level, rocky areas devoid of soil and thus incapable of carrying tree growth, areas subject to prolonged inundation and for that reason treeless, and the truly desert regions which comprise plains, plateaux and hills.

The areas which are treeless on account of their elevation are situated in the Himalaya, but those which are barren on account of their declivity are distributed over all the mountain ranges of the empire. The tracts on which no forest grows on account of prolonged inundation are chiefly found in Assam, Bengal and Burma ; they are covered with tall grasses, wild plantains and other herbaceous growth, here and there overshadowed by a tall Cotton (*Bombax*) tree. The desert areas of the Empire are chiefly confined to the drainage area of the Indus, south of the twenty-ninth degree ; but even in these deserts the courses of perennial rivers are, as already stated, fringed with tree vegetation, and though the hills in these zones are barren, small trees and bushes are found in valleys and ravines and in the vicinity of springs.

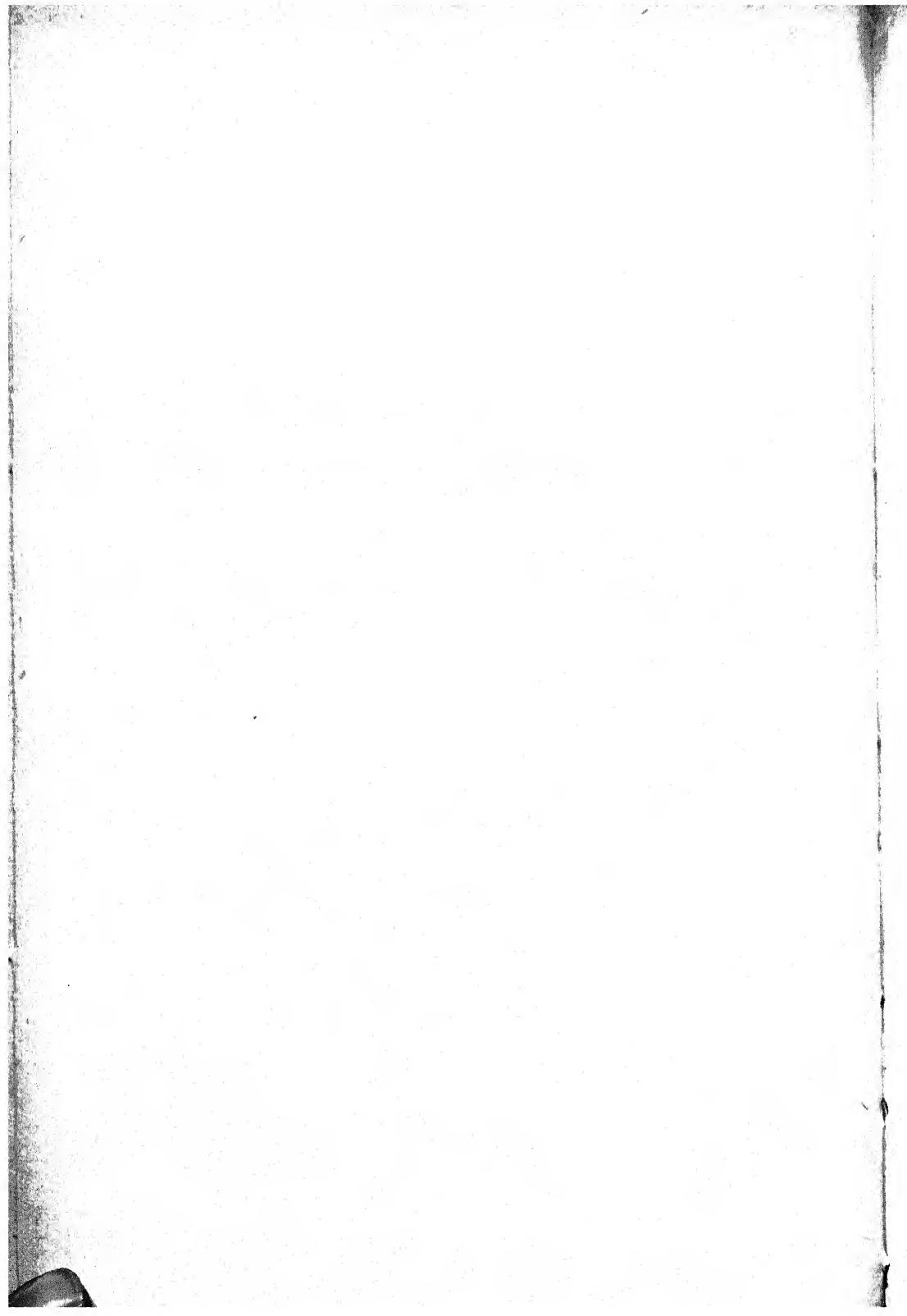
It has been already mentioned that the boundaries of these zones of the forest growth of India are nowhere sharp and distinct. There is a gradual transition of one zone into the other ; but not infrequently one zone is prolonged, with

undisturbed characteristics, far into a neighbouring one of quite dissimilar character; or, again, a disconnected area of a particular zone, definitely belonging to that zone, may be found quite outside the general limits of its own zone and surrounded by forest pertaining to a different one. The shading off of one zone into another is, of course, influenced by aspect and also by elevation. But the influence of aspect is not always constant, owing to the large area of the Continent and the great differences in climate. For instance, the scorching produced by the hot-weather sun and dry blistering winds is inimical to tree growth, as also is a cold northern exposure. And to these must be added in varying degrees the physical qualities, the chemical composition of the soil and sub-soil and the distance below the surface of the permanent moisture.

Although, therefore, it is possible to broadly group the forests into the zones and regions above delineated and to hold that these zones, for the purposes of the Forester, are sufficiently definite, it is not contemplated that such a treatment of the matter would fulfil strictly botanical requirements.

PART II

THE POSITION AND TREATMENT OF THE FORESTS
IN INDIA, 1796-1850



CHAPTER V

THE STAGES PRIOR TO THE DEVELOPMENT OF A FOREST POLICY, 1796-1850

THE growth of a forest policy in India was extraordinarily slow. There were many mitigating factors at first. Those responsible for the management of affairs had no difficulty in procuring all their requirements from the forests. The great continent appeared to hold inexhaustible tracts covered with dense jungles. Their contents were unknown, but there was no apparent necessity for their detailed exploration even had this been a possibility. The process of building up the empire province by province in itself covered a considerable period of years. Scientific knowledge amongst the European officials was confined almost entirely to the members of the medical profession ; and had this not been the case, in the early years of our occupation the botany of the forests, the species of trees they contained and their respective values, was an unopened book. The fact also that great tracts of the jungles were the aftermath of the method of shifting cultivation which had been practised for centuries, and contained nothing but a worthless scrub, was a matter which only received slow recognition.

To the Government and their officials the important part which forests play in nature and the great influence they exercise on the physical well-being of a country was unrecognised ; nor were they able to appreciate their importance to the people or their revenue-producing capacity. The Government for some years obtained their requirements without difficulty and the people took all they wanted. The early administrators appear to have been convinced that this state of affairs could go on for an unlimited period ; and that in many localities forests were an obstruction to agriculture and therefore a limiting factor to the prosperity of the country. The whole policy was to extend agriculture, and the watchword of the

time was to destroy the forests with this end in view. The direct and indirect value of the forests was under-estimated, as is clearly exhibited by the provisions of many of the earlier settlements, especially in Bengal and the Punjab, which transferred large forest areas in perpetuity to landowners or to cultivators who at that period had no legal right to them. The recipients of these grants did not at the time appreciate the boon conferred ; for they attached no greater value to the forest than the Government itself. In other cases, and they were numerous, where the forests were not entirely alienated, the main rights of users, which constitute the value of the possession of the forests, were abandoned in favour of the cultivator.

This, as will be shown, was a transitory stage, but it covered a period of several years, and enormous destruction to valuable forests was the outcome. The time arrived when, with the advance of modern civilisation and the increased demands of both population and trade, the diminution of the forests began to be regarded with grave apprehension. The spread of railways at a later period brought the matter to a head. But before their appearance the increased area under agriculture and the rapidly multiplying flocks and herds, which ensued, owing to the greater security afforded the people under the settled government of British rule, caused greater demands upon the forests and their produce. And to obtain these demands the same methods continued to be practised, the habits of a pastoral and semi-nomadic population. No check had yet been introduced into the practice of firing the forests annually in spite of the glaring anomaly that if young growth was burnt it was obvious there could be no old trees for a future generation.

The true state of affairs was not appreciated by the Government until the failure to supply local requirements began to be felt. The first of these requirements which began to give out comparatively early was timber for shipbuilding ; but in most instances the solution of the difficulties encountered was sought for in improved methods of exploitation both by Government agency or through contractors ; and even when protection was accorded this was, for many years, only given to certain species of trees and not to the forests as a whole.

A general summary of the initial steps taken towards the introduction of forest conservancy between 1796 and 1850

will be given in this chapter, fuller details being subsequently furnished under the Presidencies concerned.

With the defeat of Lally in Madras the French power in India came to an end in 1760.

As a result of the first defeat of Tippoo Sahib by the British in 1792, Malabar and Coorg were ceded to the British, who already held Canara. Tippoo's final defeat and death at the capture of Serangapatam (1799) put an end to the struggle for supremacy in Madras, and the civil administration of the Presidency by the British thereafter proceeded on comparatively peaceful lines. The growing demand for teak timber was one of the matters which received early attention.

If we omit the first efforts at bringing some method into the operations of extracting teak in Malabar (Madras) and Tenasserim (Burma), to be alluded to later, the initial step towards forest protection taken by Government was an order issued by the Bengal-Bombay Joint Commission, appointed about 1800, to enquire into the internal circumstances of Malabar and to make regulations prohibiting the felling of teak below 21 inches in girth. No further action was taken up to 1805, when a despatch was received from the Court of Directors enquiring to what extent the King's Navy might, in view of the growing deficiency of oak in England, depend on a permanent supply of teak timber from Malabar. This enquiry resulted in the immediate nomination of a forest committee charged with a comprehensive programme of enquiry both into the capacity of the forests themselves and, as important, into the status of the proprietary rights in them. Thus the first real interest aroused in the Forests of India and the resulting study of those accessible at the time originated from home, and the cause was the same which had kept Forestry in the forefront in England through a period of three centuries—the safety of the empire, which depended upon its "wooden walls." The planting of oak owing to the supineness of successive Governments had fallen into abeyance for nearly a century, and the country was faced with a shortage in timber supplies which, in view of the bid of the French for sea supremacy, might well spell the doom of England.

The reason for the Court of Directors' enquiry relative to teak does not appear to be on record. They were probably aware that the Arabs imported teak from Bombay for building their fleet. The timber had long been prized. But it is curious that Bontius first described the teak under the name

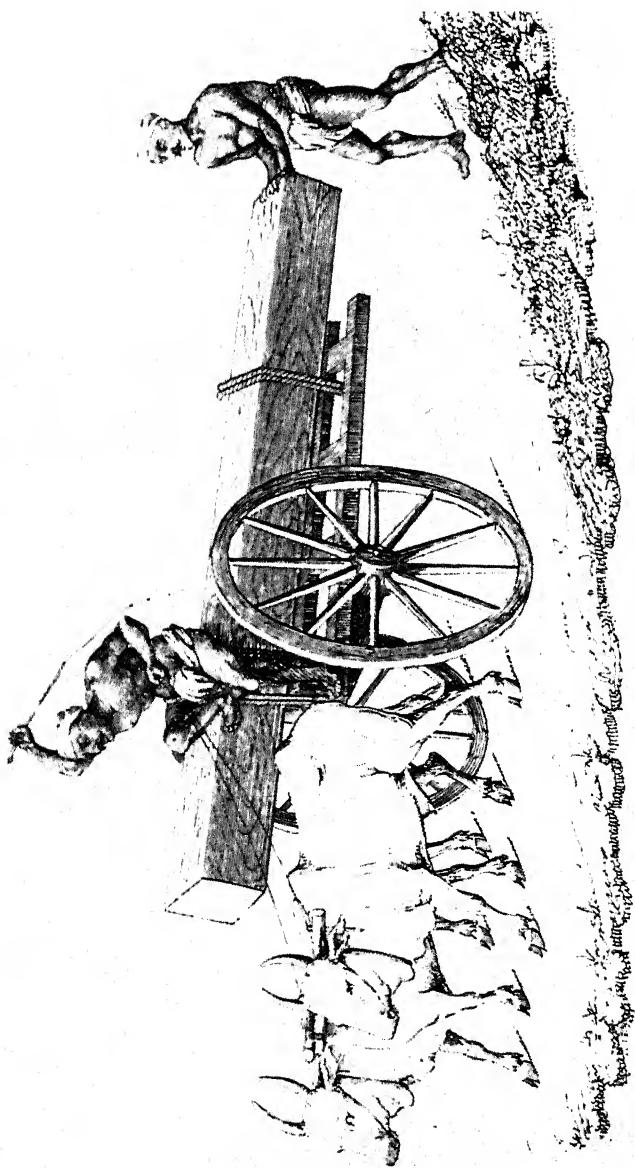
of *Quercus Indicus*, although save in the strength of its timber the tree has no affinity to the oak.

Rhœde has given an accurate representation of *Tectona grandis* and refers to the teak forests of Malabar in these terms (*Hort. Malab.*, iv, t. 27) : "Crescit ubique in Malabar, at præsertim in provincia Calicolan (Calicut) ubi integræ sylvæ ingentium harum arborum reperiuntur. . . . Lignum vero hujus arboris quercino ligno haud absimile operi fabrili accommodum, atque naupegis ad navium fabricam in usu est : sed in aquis (præsertim dulcibus) teredini facile obnoxium."

The reports submitted by the Forest Committee were by no means reassuring. They brought into evidence that the capacity of the forests in mature teak timber had been overestimated ; that the more accessible forests had been almost cut out, and that to tap the more distant ones would necessitate the construction of costly roads. At the same time the Committee pointed out that if protection were afforded the forests a valuable property would be gradually built up. Thus, as had been the case in other countries on the initiation of a forest policy, next to the utilisation of the forests, the oldest branch of the science of forestry, protection proved the next necessity if the forests were to be saved from total ruin and disappearance.

The immediate result of the Committee's report was a general proclamation declaring that the royalty right in teak trees claimed by the former Government in the south of the continent was vested in the Company and all further unauthorised fellings of this tree were prohibited. Under further pressure from the Home Government, and with regard to the maintenance of the future strength of the King's Navy, the decision was taken to appoint a special officer to superintend the forest work, who should have a knowledge of the language and habits of the people in addition to a knowledge of the forests. His duties were to preserve and improve the production of teak and other timber suitable for shipbuilding. Captain Watson of the Police was the officer selected, and he was appointed the first Conservator of Forests in India on 10th November, 1806. Under the proclamation of April, 1807, he wielded great powers, which unfortunately were somewhat vague in both scope and in the amount of interference he was to undertake in the established order.

The Conservator soon established a timber monopoly throughout Malabar and Travancore and furnished Govern-



COUNTRY CART LOADED WITH A SQUARED TEAK BEAM OF 20 CUBIC FEET. MADRAS
From Cleghorn's "Forests and Gardens of South India."



ment, as did his immediate successors, with a plentiful supply of cheap timber. But the methods by which this was done were intolerable and gradually gave rise to seething discontent amongst both proprietors and timber merchants. The feeling rose to such a pitch that the Conservatorship was abolished in 1823 and a great reaction set in to the detriment of the forests.

It was not till 1831 that the Indian Navy Board recommended the re-establishment of the Conservatorship. They consulted the Madras Board of Revenue. The Revenue Board took no action. In 1838, when submitting various reports from Collectors containing more or less practical proposals, they merely suggested that interference, if at all necessary for the conservation of the teak forests, should be under the Revenue Officer; that the latter might be authorised to take steps to prevent the felling of small timber and undersized trees. But they were not in favour of appointing an independent authority.

In 1842 the Court of Directors were of opinion that something might be done to improve the forests by the formation of teak plantations. Although little was attempted on a large scale, under orders of the Madras Government in this direction on the initiation of the Collector of Malabar, Mr. Conolly, the first beginnings of the Nilumbur teak plantations were inaugurated, plantations which have since become famous. Though it was being constantly urged that scientific advice in the management of the forests was becoming an urgent necessity, no step was taken in this direction until the Bombay Government in 1847 appointed Dr. Gibson Conservator of Forests in the Presidency, he having filled the post as *interim* Conservator for some years previously in addition to his duties in connection with the Botanical Gardens.

In Burma the exploitation of the teak forests dated back long before the advent of the British, the teak having been a "royal" tree in Tenasserim and, in fact, in the whole of Burma, long before the British occupation of any part of the Kingdom. The interest of the Home Government was early awakened on the subject of the importance of the Burmese teak timber owing to the decreasing supplies from Malabar and Western India. The Tenasserim Provinces were ceded to the British in 1826 under the Treaty of Yandaboo, and in 1827 Dr. Wallich was deputed to examine the forest resources of the country. He reported that they were unrivalled in comparison with those of any other of the territories in occupation by the East

India Company. The advice tendered by Wallich was only partially acted upon, however, and the short-sighted step was taken in 1829 of throwing open the forests to speculators who paid an *ad valorem* duty on the timber extracted. As a result of this policy anxiety as to the maintenance of supplies was being felt locally in 1837. Dr. Helfer was deputed to examine the forests, and reported on the absence of young growth and recommended the formation of plantations. Nothing was done in the matter. In 1841 a proposal was carried against great opposition to cancel all old leases and contracts and issue new agreements with sufficient safeguards in the interests of the future maintenance of the forests. But in practice the safeguards introduced proved to be ineffective.

Captain Tremenheere was appointed Superintendent of Forests in 1841 and reported on the forests and drew up rules which, had they been put into operation, would have done much to save the forests from the ruthless exploitation to which they were being subjected. But neither he nor his successors received the support of the Government. Captain Guthrie with the support of the Commissioner, Captain Durand, attempted to enforce the rules and confiscated areas belonging to licencees who had failed to carry out the rules. But this action was vetoed by the Government and the grants restored. Towards the end of the period Mr. Colvin, the Commissioner at the time, formed a small Forest Department and introduced new rules. But he was strongly in favour of selling the forests outright or giving long leases of ninety-nine years—a policy which fortunately did not meet with the approval of the Court of Directors.

In 1849 Dr. Falconer was deputed to visit and report on the Tenasserim forests. His report belongs to the next period.

In Upper India but little attention was paid to the forests by the British officials during this period. The ruthless methods of exploitation, burning and grazing, which had been in force for centuries, continued unchecked. The question of opening out the hill forests of the Punjab and of affording them some measure of protection was receiving some attention in the middle of the century, but no attempts of this nature had been commenced in the North-West Provinces or in Bengal. That the sâl forests of the N.W. Provinces were valuable had been known since the campaign against the Gurkhas in 1814-16; for the latter themselves attached a great value to them. Dr. Wallich had reported upon them in 1825 and on

the ruthless manner in which they were exploited. But no attempts at conservation had been instituted. The great forest tracts in the Central Provinces and in Assam were unexplored and unknown at this time.

During this period a certain amount of correspondence and reports appeared on the serious consequences which the great destruction of forests was having upon the water supplies in certain parts of the country, and on erosion in the hills and the silting up of rivers, creeks and harbours on the coast. In one of his first reports after being appointed Conservator in Bombay Dr. Gibson gave a list of rivers and creeks on the Malabar coast, all of which had silted up within the memory of men living at the time he wrote the report. This aspect of the results following the destruction of forests will be dealt with in detail in the next part.

CHAPTER VI

FOREST OPERATIONS IN THE MADRAS AND BOMBAY PRESIDENCIES, 1796-1840

DURING the earliest days of the British occupation in Madras and Bombay but little regard appears to have been paid to the forests, save as a timber-yielding agency. Nor, when enquiries began to be made into their timber resources, was the information collected on their early history anything like as complete and detailed as that obtained later regarding the Tenasserim Forests. The history of the Forests of the two Presidencies during the period under consideration is so inextricably interwoven that it has proved necessary to review it concurrently.

The principal forest districts were those of Malabar, Canara, Travancore and Guzerat on the west; and on the east extensive forests in the neighbourhood of Rajahmundry stretching inland in a westerly direction towards the territories of the Nizam of Hyderabad. The Malabar forests were supposed to contain abundant stores of excellent teak timber, and for this reason they early attracted the notice of the Bombay Government, to which the Province of Malabar was subject for some years after its acquisition. In those early days it was assumed that these teak forests were private property.

The forests were regarded from the purely utilitarian point of view. Teak timber formed the main demand of the Government officials for shipbuilding, military and other purposes, and the arrangements necessary for felling the trees and their transport from the forests was the only end in view. The earliest record of these attempts is the formation of a timber syndicate in Malabar in 1796 in which enterprise Mr. Machonochie of the Medical Service was the prime mover. This syndicate appears to have prospered for a time and then collapsed. Other similar attempts were conceived, chiefly in connection

with the supply of timber for the Navy, but they met with a chequered existence.

On the subject of the amounts of teak extracted from the Malabar forests and the prices ruling at this period the following extract from Milburn's *Oriental Commerce*, 1813, Vol. I, 328, is of considerable interest :—

" In the year 1799, 10,000 teak trees were brought down the Beypur River (Malabar). This was the produce of several years ; but it was estimated that from 2000 to 3000 trees may be annually procured."

" Teak timber, of an ordinary quality for shipbuilding, sells at 9 or 10 rupees a candy, which measures $15\frac{3}{4}$ English cubical feet ; a foot therefore costs from 1s. 6d. to 2s. Choice timber sells as high as 16 rupees a candy, or 1s. 10d. a cubical foot. Bombay is generally supplied with teak plank from this part of the coast. The Company usually contract for what they require, and the Resident at Cochin frequently has the contract. The following are the prices at which the Bombay Government was supplied in 1800 :—

1st Sort, 40-50 ft. long ..	14-16 in. square ..	Rs. 4-16 per candy.
2nd .. 35-40 ..	13-14 ..	10-12 ..
3rd .. 22-35 ..	12-14 ..	9-10 ..

Plank from 1-5 borels thick 30 per 100 guz.

" This was of the first quality, the plank of the usual length and free from rents. Notwithstanding the coast of Malabar may be considered the storehouse for Bombay, yet the demand for teak timber has so much increased that within three or four years large quantities have been imported from Rangoon."

Within a few years after the first attempts to extract teak from the Malabar forests by European syndicates grounds arose for believing that, whilst Tippoo Sahib held sway over this part of India, the right of felling teak had been (as it was up to 1840 in the neighbouring countries of Cochin and Travancore) an exclusively royal privilege, i.e. that teak was a "royal" tree.

In August, 1800, the Court of Directors accordingly authorised the Bombay Government to assume this right on behalf of the East India Company. As the Province of Malabar had now been transferred to the Presidency of Fort St. George (Madras), the Court's instructions were not given effect to. It was the enquiry addressed to the Government of Bombay by the Court of Directors in 1805 which first stimulated the

former to make active enquiries on the subject of the teak forests the control of which had intermediately been restored to them. The teak timber was required for the King's Navy and a Commission of Survey was appointed by the Bombay Government, the Commissioners being given a wide latitude which covered not only the composition of the forests but also the proprietary rights existing in them. They were to report on what could be regarded as public forests and to distinguish them from groves and plantations forming private estates. This enquiry led to the proclamation (25th April, 1807) that the royalty rights in teak claimed by former Governments were vested in the Company, and all unauthorised felling of teak by private individuals was prohibited. In the previous year Captain Watson had been appointed the first Conservator of Forests in India, his charge being Malabar and Travancore.

The proclamation of 1807, which formed the basis of the Conservator's authority, contained no definition of the term "sovereignty," nor had those forests been specified over which the sovereignty extended.

The instructions of the Court of Directors of 1800 indicated that their object was to obtain a regular supply of timber for public purposes, from unappropriated lands, to which alone the proclamation was intended to apply. It was not intended to invade private property.

In the district of Palghaut Captain Watson reported that the inhabitants generally resigned their claims to the forests without a murmur. Some of these forests were claimed as hereditary property, but the owners subsequently admitted that they held the forests only as a grant from the Rajah of Palghaut to their ancestors. They consented to resign their claims and to take charge of the forests as overseers of forests, receiving in settlement a royalty for every tree felled. The Conservator, on his own authority apparently, applied this or a similar procedure to the rest of the forests, and succeeded within a short space of time in establishing a monopoly of all the timber throughout Malabar and Travancore. He felled timber for Government purposes not only in the private forests, but even trees growing on cultivated lands paying revenue to Government, the proprietors being interdicted from felling teak without the sanction of the Conservator, either for sale or for their own use; or to remove young trees springing up and injuring their arable land. It does not appear

clear from the records whether the royalty payment per tree was paid outside Palghaut. The private timber trade was annihilated : for even if they bought timber with the Conservator's permission timber merchants could not market it, exploitation, save by Government agency, having been prohibited. The wasteful methods of felling and extraction by the timber merchants prior to the establishment of the Conservatorship had been admittedly appalling, but the new regime was far too drastic to be continued as a method of permanent administration. The privilege of cutting fuel for private use, which had been practised at will by all from time immemorial, was also invaded and prohibited, a short-sighted step of amazing folly.

It is true that the forests received a modified form of protection during the period of the Conservatorship. Some regulation of the fellings was introduced and the former unrestricted and wasteful exploitation by private persons and timber contractors ceased.

By 1823 the growing discontent of the forest proprietors and timber merchants, chafing under the restrictions of the timber monopoly, and the outcry of the peasants, indignant at the fuel-cutting restrictions, came to a head. On the recommendation of the Governor of Madras, Sir Thomas Munro, and with the consent of the Supreme Government, the Conservatorship, in which Captain Watson had been followed by several successors during the seventeen years of its existence, was abolished.

As was to be expected a great reaction set in and the benefits which had accrued to the forests were dissipated. The land-owners took possession of the forests and unchecked felling once again reigned supreme. Even the Government forests, the ownership of which was not in dispute, were the subject during succeeding years of almost unrestricted fellings, encouraged rather than checked by one of the timber agencies founded on the lines of the one established by Mr. Machonochie. This agency, under the supervision of an officer of the Indian Navy, made large advances for timber to native contractors. As a natural outcome of this deplorable retrogression on the part of the authorities large forest areas were entirely lost to the Government, never to be recovered ; others were ruined ; whilst many of those in the more accessible situations on river banks were cut out and disappeared. The consequences of this reckless exploitation were inevitable.

Within a few years the available supply of really first-class teak timber contracted and prices rose.

The alarming clearances of forests and the reckless destruction of young growth, which should have been left to replace the old trees, was brought to the notice of the Government of Bombay in 1830 by the Nilumbur Rajah, who represented that this unchecked freedom in exploitation had given rise to inconveniences of scarcely less magnitude, though of a different nature, from those which existed under the former conservancy system. That timber of the best quality could no longer be procured and the inferior kinds were only obtainable at enhanced prices, and that this state of affairs appeared likely if unchecked to result in the entire disappearance of the forests.

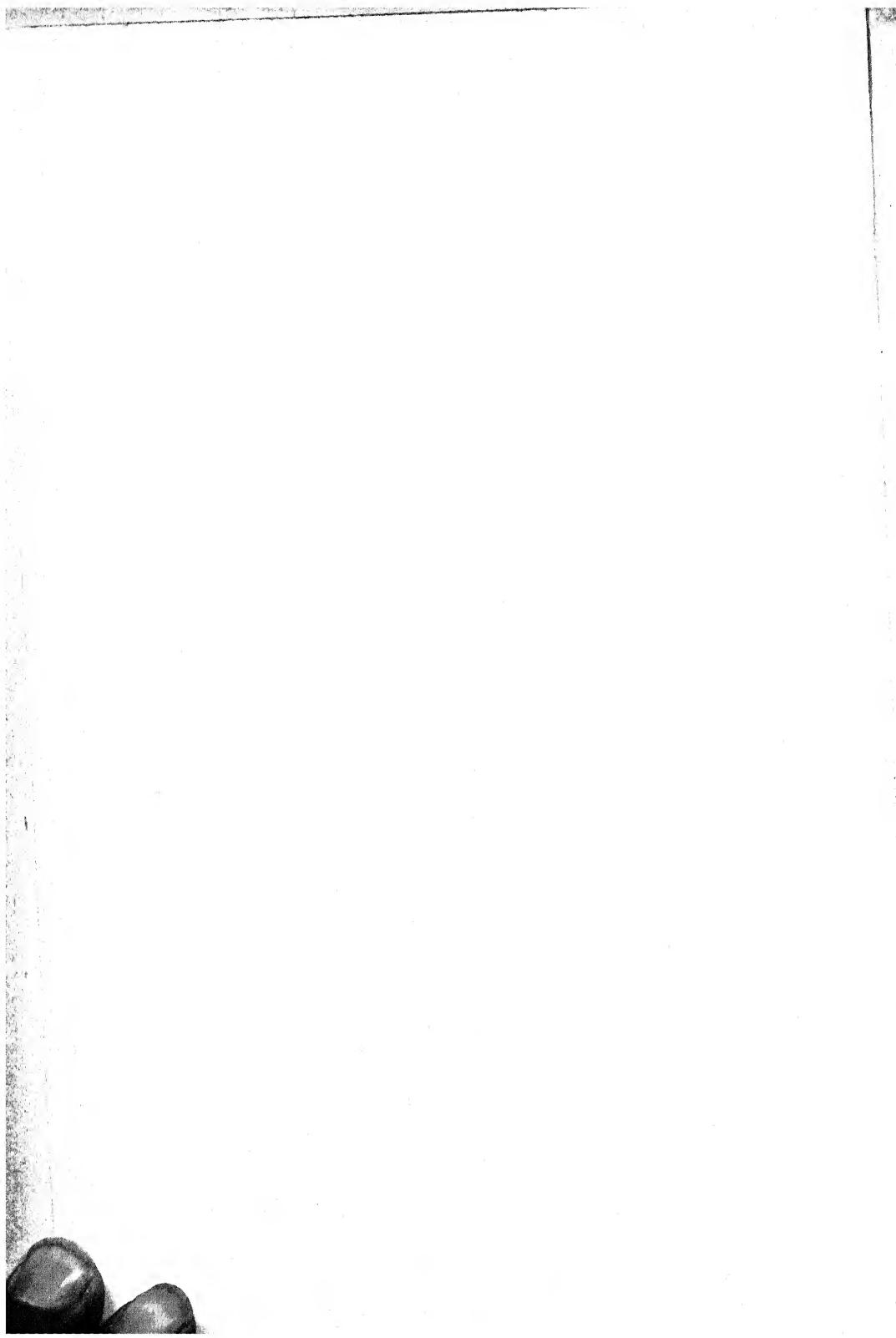
After giving due consideration to this representation the Government of Bombay requested the Indian Navy Board, on 20th April, 1830, to submit a report on the Malabar forests with a view to introducing arrangements for their preservation and improvement. In reply the Board strongly advised the reinstitution of the Conservatorship, the Conservator's duties being limited solely to the preservation of the forests. The Government of Madras was then consulted and transferred the reference to their Board of Revenue for consideration and report (22nd April, 1831).

The Board of Revenue took no action. In September, 1837, a report was received from the Resident of Travancore on the forests of that Province and the subject was again reopened. The Government of Madras called the attention of the Board of Revenue to their previous letter, and in connection with the report on the Travancore forests asked the Board to consider measures for the protection and improvement of the timber forests under its charge. The Board replied that enquiries would be instituted, and at the same time furnished a report from the Principal Collector of Malabar, Mr. Clementson, dated 3rd April, 1834, in which that officer, referring to the Nilumbur Rajah's letter and to the recommendation of the Indian Navy Board, condemned all direct interference by the officers of Government in the cutting of timber in that district, considering that this would be an infringement of the rights of public property; but he suggested the imposition of a heavy duty on all teak timber which weighed less than three candies. This reply is representative of the opinions held by the majority of the officials of that time. Whilst energetically



FIVE LOGS FROM ONE TEAK TREE, SOUTH COINBATORE, MADRAS
Dimensions of log (with figure); Length, 16 ft. 9 in. Mean girth, 6 ft. Volume 285 cubic feet

From "Indian Forester," Vol. XLII



supporting the rights of private ownership they forgot the equal rights of the community which were gravely imperilled ; since with the complete destruction of the forests the material required by the far more numerous body of agriculturists in the country could not be supplied, and large areas would go out of cultivation owing to the diminution of the water supplies.

In September, 1838, the Board of Revenue again addressed the Government of Madras and forwarded reports on the Malabar, Canara and Rajahmundry forests from the Collectors of these provinces. A brief review of these reports, including the one from Travancore already mentioned, is necessary before dealing with the Board's reply.

While the Malabar and Canara forests were in full progress of exhaustion, the conterminous forests belonging to the Rajah of Travancore, abounding in excellent teak, were under a good system of management, which yielded large supplies of teak yearly, while at the same time suitable provision was made for the perpetuation of the forests. Of every ten trees fit to cut *two* were left standing for seed ; and for every tree felled ten young trees were planted, the management being conducted by a Conservator (who appears to have been a Scotch Forester) under the control of the Resident at Travancore. Captain Cortland Taylor stated that a million young teak trees were planted during the time of Colonel Newal (a previous Resident) alone.

The Travancore report (August, 1837) was from Mr. Munro, the Conservator of the Travancore Forests, to the Resident, Colonel Fraser. The teak in Travancore had apparently been considered the property of Government, and a Conservator had been employed for some years. Munro gave some interesting sylvicultural notes regarding the growth of teak. "The teak tree shoots up for the first seven or eight years remarkably fast till it attains the height of 12 or 15 feet, after which its growth is uncommonly slow, and it does not attain the rise of the 6th-class log even in the most favourable situations till it is about 35 or 40 years old ; a 5th-class log takes about 50 years, a 4th about 60 years, a 3rd about 70 or 80 years, a second about 90 and a 1st class takes about 100 to 120 years." Munro said he made this statement with confidence, as he had acquired his information from his "own personal observation and the experience of nearly 20 years in the woods." He added that a tree of the 1st class will remain

"sound and good" for nearly 200 years and then begin to decay slowly. Munro added some other interesting sylvicultural details which proved him a forester of no mean calibre for those days in India. To season the timber after ringing he allowed the tree to stand one or two years, when it was felled and piled up in a dry place whence, in the third year after ringing, it was sent down for sale.

The following extract from Munro's report is of interest : "The system of throwing open teak forests to all who wish to cut, or giving them to contractors, is in the highest degree ruinous. They cut indiscriminately all that comes in their way ; any range of forest, however extensive, would be destroyed if left to their tender mercies. They never think of planting, and all that such speculators calculate on is present profit or loss, without troubling their heads about depriving future generations of the benefit they now enjoy. The teak forests in Malabar are, I am told, in this predicament, and if the British Government do not oblige them to plant, and also leave some large trees here and there for seed, this valuable tree will be extinct. There are two ranges of hills in our forests that were formerly rented to a Parsee, and if the contract had not been taken from him, before it was too late, he would not have left a teak tree standing. It will take 40 to 50 years before the forests recover the effects of his avarice." Munro mentioned in the same report that he estimated that there would be upwards of 100,000 trees fit to cut that season, and with reference to the quality of the Travancore timber, Captain Cortland Taylor stated that a large quantity of selected teak had been contracted for at Allepee in October, 1837, for the Ceylon Government, at Rs.81 $\frac{1}{4}$ per measurement ton, and that the price was expected to rise during the season to Rs.100.

The Malabar report of May, 1838, by Mr. Clementson dealt with the position of the forests. With few exceptions they were the property of private individuals, who appeared most generally to have permitted the felling of teak without discrimination as to age or size of the trees in consideration of what was termed the "*Kooty Kunum*," which was a fee of one rupee paid by the coast timber merchant for each tree cut down. The only forest owner who pursued a different course was the Nilumbur Rajah, who being aware of the value of his forests, exploited them himself, cutting and transporting the timber to the river banks where he sold it, realising, it was said, a profit of about 100 per cent.

The Forests of Malabar were at some distance from the sea-board, but the timber was rafted down the rivers to the coast. When all the large trees most adjacent to the rivers had been cut out, and the transport from the more distant forests became too costly, the timber merchants turned their attention to the smaller trees, and these followed their predecessors. It was this admitted state of affairs which caused Clementson to reiterate his suggestion of the imposition of a high duty on undersized material with the object of putting an end to the sale of young trees. An all-round duty of 8 per cent per candy only was paid on the timber, 5 per cent inland duty and 3 per cent sea duty. This duty averaged Rs.9 $\frac{1}{2}$ per candy (1st class, Rs.12; 2nd class, Rs.9; 3rd class, Rs.8). As can be well imagined the coast dealers (who sold the timber to the Bombay merchants) made enormous profits. The revenue derived from this source by the Madras Government was stated in 1837 to be Rs.27,000 on an export of about 33,000 candies! Many fortunes were made at this period in the Indian timber trade.

Clementson, contrasting the Travancore forests with those of Malabar, said the easier conditions in the former were due to the fact that they belonged to the Government and that restrictions could therefore be adopted in Travancore which owing to the private ownership would be impossible in Malabar. He repeated the recommendations cited in his letter of 1834, the imposition of an enhanced duty on undersized material "as the best and only equitable means of checking in some degree the destruction of young trees." Clementson maintained that the forests still abounded in valuable trees, that the exportation of timber was progressively increasing and that in his opinion the difficulty alleged to have been experienced in providing timber had been greatly exaggerated. And, he added, it was reputed that no trees had been felled in the Palghaut Forests since 1828 and that they were rich in timber. These were conservative and *ex parte* opinions which investigations by officers detailed for the purpose later on failed to substantiate.

The 1838 report on the Forests of Canara was from the Collector, Mr. H. M. Blair. The teak forests, he said, were considered to be the property of Government, and no trees could be felled without permission. In Southern Canara little teak was to be found, whereas in the north considerable quantities of teak trees existed, both at the foot of and above

the Ghâts. These forests were originally considered sufficiently valuable to be placed under the charge of a Conservator (Captain Watson and his successors), who was stationed at Sedashegur, and had a large establishment under him to fell the timber and transport it to the coast. The Conservatorship was abolished in 1823. The forests were then left under the care of the Revenue authorities, who took measures to prevent trees being injured or felled; but from want of an experienced establishment were unable "to improve the trees or to plant young ones when required." The teak in North Canara was divided into two classes. "The first is a dwarfish stunted tree, seldom growing 50 feet in height, of which there are extensive forests in the eastern frontier of the Soopah and Sondah talooks. The degenerate size of this tree is attributable to its growing at a distance from the line of Ghauts under unsuitable conditions." The timber was not suited to ship-building, but was thought to be well suited for gun-carriages, agricultural implements and small beams and rafters. These forests were thought to contain about 154,000 trees. Considerable numbers of the trees were felled annually, and conveyed to the Mahratta country for building purposes. Permission to fell had to be obtained, and a payment of a duty of 5 per cent of the value of the wood, estimated at Rs.9 per candy. In 1836 and 1837 a total revenue of Rs.5424 was received from this source. The second class of teak "is found along the line of the Ghauts and is the description which is valued for naval purposes." It was conjectured that there were upwards of 40,000 of these trees in the forests. Most of them were at some distance from the streams and therefore difficulty would be experienced in extracting them, all the timber which could be easily floated down having been removed by the Conservators under the old regime. The supervision of the forests was now in the care of the Revenue authorities, and Blair was of opinion that their preservation was sufficiently secured by the system then in force. But little teak wood was removed in the district and trees were seldom stolen. The chief destruction to the forests was done by the *kumri* (or shifting) cultivation on the hill-sides, but this evil was easily checked by the Revenue authorities. The improvement of the forests, Blair admitted, was a work of difficulty since there was no one in the province with a practical knowledge of Forestry. Colonel Gilbert, who had been Conservator for some time, planted some small experimental teak plantations both on the coast

and under the Ghâts, but they had proved failures. It was subsequently ascertained that the positions chosen by Gilbert were most unsuitable for the growth of teak. Blair recommended the deputation of an officer to inspect the forests in order to compare the value of their timber with other forests. He also expressed his concurrence with Munro on the impolicy of renting out the forests, being of opinion that no trees ought to be cut save those selected by a proper officer. He thought that the forests ought to be inspected for other products besides teak, as they contained "poon-spars, blackwood and other more common timber, which might be found a valuable source of revenue." A most interesting remark, since it displayed an intuitive insight of the fact, realised at a much later date, that the exploitation of the forests should not be confined to the one principal timber, but that an attempt should be made to place other species on the markets.

The report on the Rajahmundry forests was by the Collector, Mr. G. A. Smith, dated August, 1838. He stated that the forests were not exactly in the Rajahmundry district, but about 70 miles beyond its frontier "in the territories of the Nizam of Hyderabad in that part called the Cumbham Mittoo Licar." Merchants who wished to purchase the timber of these forests sent agents, who made advances to the hill people who cut and delivered the timber to them on the banks of the Godaverry, from whence it was floated down to Rajahmundry. Smith was of opinion that the supply of big timber from these forests was falling off, since when he first joined the district in 1822 he had seen an immense quantity of large timber for the supply of which the forests had been severely taxed, and that now only small timber was to be observed, and complaints had been made about the failing supply.

In submitting the reports of the Collectors of Malabar and Canara the Board of Revenue expressed the opinion that interference, if at all necessary for the conservation of the teak forests, should be left in the hands of the Revenue officers; that no independent authority should be set up, and that the Collector of Malabar might be authorised to issue orders prohibiting the felling of small timber and under-sized trees. They passed no remark on the Rajahmundry report.

These proposals were so obviously short of what was essential if the teak forests were to be saved from destruction that the question was referred to the Military Board at Madras for

their views, both as to the perpetuation of the teak timber supply and to the development of other timber products. The Military Board deputed Lieutenant Miller, of the Ordnance at Canara, in November, 1838, to make enquiries in that province. He was to examine the forests "particularly with reference to the resources in saul timber as well as teak," and the Resident in Travancore and Collector in Malabar were also requested to report on the resources of their forests in sâl timber. This appears to be the first record extant on the possible utilisation of the sâl, which, in the absence of teak, held the premier place in the timber markets of the plains forests of Central, Northern and North-Eastern India.

Meanwhile, the Government of Bombay had been carrying out an enquiry of their own. Little or no supervision up to 1838 had been exercised over the felling of the timber in their forests since the country had been acquired. Teak and blackwood had been regarded as royalties, and in the Deccan and Concan were considered the property of Government on whatever land they grew, "except in those known lands and villages where the right to timber had been specially granted to the Mandaris by the terms of their sunnud." In the year 1838 the attention of the Government was drawn to the indiscriminate destruction of the forests then going on; and the necessity which existed for adopting measures to check their further reckless waste in the Bombay Presidency was considered. The first step adopted was to issue orders, in 1839, prohibiting the felling of teak without express permission. In the following year Dr. Gibson, the superintendent of the Botanical Gardens, was directed to inspect and report upon the northern forests. His report confirmed the destruction taking place.

The subject of the supply of larger teak timber had been brought up in May, 1838, by the Commissary-General at Bombay who had asked whether, in concluding a timber contract, he should stipulate for a supply of larger timber for frigates and line-of-battle ships in anticipation of such vessels being again built at Bombay for Her Majesty's Service. The Government referred the matter to Admiral Sir C. Malcolm, Superintendent of the Indian Navy, and requested him to consult Captain Harris of the Indian Navy, who had been Timber Agent in Malabar in 1828-29, and had some practical knowledge of the timber resources of the Malabar Forests. The Admiral was also asked to express an opinion as to whether the timber supplies required by Government could be best

obtained by contract or agency, a point which was being debated. Admiral Malcolm replied with commendable promptitude in the following month submitting a report from Captain Harris. This report confirmed the appalling destruction of the accessible forests which had taken place, trees of all sizes having been felled and all accessible supplies near to water carriage being exhausted. Owing to the inadequate transport arrangements of the merchants for dealing with large timber in the more remote localities distant from the rivers, where the aid of elephants and experienced men was required to extract the timber, both the Admiral and Captain Harris recommended the appointment of an officer at Malabar as agent for the supply of timber; and the Admiral further proposed to add to the duties of the agent that of Conservator of Forests with full power to supervise felling operations and the protection and amelioration of the forests. As a preliminary step he advised the deputation of an officer to Malabar and Canara "to examine into the state of the teak forests and report upon them." In his report Captain Harris agreed as to the correctness of the views expressed in the Nilumbur Rajah's letter already alluded to.

In the same year, 1838, the Commissary-General again addressed the Government of Bombay on the subject of the supply of timber and submitted a report by Lieutenant Thresbie and a letter from Mr. J. Fell, "senior merchant of Calicut" and a member of the Bombay Civil Service. Thresbie was Sub-Assistant Commissary-General at Malabar and had been deputed to obtain information about the forests. He appears to have absorbed many of Clementson's ideas on the subject, for in his report he says, "that the statements which had been made as to the alarming decrease of their (i.e. the Malabar Forests) resources in teak were groundless." In other respects his report coincided with Clementson's views. Mr. Fell's letter dealt with the question "whether a contract or an agency was the better mode of procuring timber for the public service." He was decidedly in favour of an agency as, having had a good deal to do with the timber problem, he said that all contracts within his knowledge since 1832 for any large supply had failed or proved unsatisfactory. And he added: "I am in doubts of there being any person in possession of *Kooty Kunum*, or right of selling teak timber, to make a contract, and if there are, whether in the forests to which that right applies there be trees adequate for naval

purposes, for with the exception of one district in the north-eastern quarter and another to the southward all the forests of Malabar are exhausted."

The Government of Bombay did not act upon these reports, but communicated their substance to the Court of Directors and forwarded a copy of them to the Madras Government for suggestions or arrangements calculated to assist in obtaining the necessary timber supplies. The Government of Madras referred the matter to the Board of Revenue, and the latter, in January, 1839, noticed the great diversity in opinion on the subject of the amount of timber contained in the Malabar Forests, and pointed out that the only consensus of opinion was upon the question of an agency being preferable to contracts. They therefore advocated the appointment of a qualified agent to inspect personally and report upon the extent and condition of the timber from whose labour they anticipated much benefit. For they recognised that if the forests were being ruined, "no time should be lost in taking steps to reform a system which must ultimately prove so injurious to the interests of the Province in the destruction of one of the most valuable products."

This looked as if something at length would be done, but for some years it remained a mere expression of opinion.

The Indian Navy Department again came on the scene with a letter received from Sir Robert Oliver, the Superintendent, by the Government of Bombay in January, 1839, on the subject of procuring timber for the construction of certain steam vessels which it was proposed to build at Bombay. This letter was the outcome of a representation from the Controller of the Dockyard, Lieutenant Williams, pointing out that his stock of timber was small and the supply in the market scanty, the material inferior and the prices increasing. Sir Robert asked that immediate steps should be taken to procure good timber at an equitable price, for, he said, "a continuance of the present contract system will preclude the possibility of building at all in Bombay, and be the means of forfeiting the high character hitherto maintained in this branch of the Service." He advised the deputation of Lieutenant Williams to the forests as Agent to select and purchase the required quantities of timber. The Government of Bombay agreed to the proposal, and Williams was deputed to the coast of Malabar as a temporary measure and the arrangement was reported to the Government of Madras. In reply the latter

Government sent the correspondence, already mentioned as having been received from their officers, with a view to showing that the improvement of the forests of Malabar had been engaging their attention though "nothing decisive towards that end had been done" owing to the limited information as yet available. They agreed to the recommendation of the Board of Revenue on the subject of the deputation of an officer to inspect and report on the forests, and as Lieutenant Williams had already been deputed to Malabar they advised his being entrusted with that duty. They would accordingly instruct their officers to assist him.

A most notable contribution to this rather chaotic correspondence and procedure was issued shortly afterwards in a Minute dated 4th April, 1839, by Mr. Farish, who was then acting Governor of Bombay.

Farish supported the proposal to station an Agent permanently on the Malabar coast to purchase timber for both Governments. He did not agree with Clementson and Thresbie as to the great abundance of teak in the forests. He proposed that a survey of the forests should be made in order to distinguish between the Government and private forests and so secure the private rights. He suggested that during the progress of this survey, and as the private claims were admitted, the Government should "endeavour to purchase the royalty or forest rights" on such tracts as were well suited for the transportation of timber to the coast either on the plan adopted by Watson in 1807-8 or in any other way determined upon. By the term "royalty or forest rights" Farish explained that he meant a right to exercise the conservancy of the forests, and to forbid the felling of timber not of proper size, or not requiring to be removed for the purpose of thinning the forests or other sufficient reasons of which the Conservator would be the judge. This appears to be the first allusion in the correspondence to the sylvicultural necessity of carrying out "thinnings" in the forests. Farish saw nothing in the office of Conservator which need interfere with private rights, provided the Conservator's powers and work were strictly defined and any interference with private rights forbidden and the office placed under the Collector of the district. He commended for purchase the tracts near rivers in Malabar from which the large timber had been cleared, and he advised that on all lands of which the royalty was purchased the Government should retain a prior right to the timber felled

on payment to the proprietors of the usual rate of a rupee per full-sized tree, and for young trees cut out in thinnings under the direction of the Conservator the rate which was in force for such material ; and that the proprietors should have the privilege of obtaining permission to fell timber within their lands *bona fide* for their own buildings and requirements. Farish pointed out that the effect of the proposed measures would not be fully seen for twenty years, adding, "we are now in 1839 perceiving the effect of the retrograde movement in 1821, and it will not be till the approach of 1860 that the advantages of any changes now adopted will be well appreciated," and therefore the means which may be adopted "must not be ephemeral or liable to be changed by future Governments ; they must be continued for at least thirty years to show their effect, and any record of their success must be made with reference to that distant period."

Farish did not approve the suggestion of levying a high duty on small-sized material with the object of attempting to stop the felling of immature trees. Being of opinion that the measures advocated for Malabar should be applied to all the forests of the provinces he sent the whole correspondence to Williams with, as desired by Madras, the request that he should report on the "present extent and condition of the timber for the joint information of the two Governments." This was adopted and the whole subject was reported to the Court of Directors (May, 1839).

Williams submitted two reports on the forests in the same month. In his forest report he stated that timber was selling at a very high price because the timber market had fallen into the hands of three or four moneyed natives who, by advancing sums of money from time to time to the forest proprietors, contrived to get many of them into debt and thus created a monopoly. He had made arrangements direct with some of the proprietors for a supply of timber. He mentioned that the timber of the Nilumbur Forests was the very best in all Malabar and the supply likely to last six or eight years. In his second letter he confirmed the report as to the reckless devastation which had been committed in the Malabar Forests, and he also commented strongly on the crude methods of exploitation in force, "logs were pushed over declivities, sometimes of hundreds of feet, thereby causing rents in the timber and contributing in some measure to its inferiority." Within the two preceding months

from the time he wrote it appeared that forty thousand young trees had been floated down from the jungles from forests in the neighbourhood of Wada Kancherry, "the diameter of which was under 6 inches." As the proprietors sold their trees for a rupee each he suggested that Government should purchase a number and leave them to be felled at some future period. Williams said that the Government of Madras only possessed proprietary rights in three forests in the vicinity of Palghaut; that those forests contained from five to six hundred trees, but very few young trees, as all the young growth was destroyed by the annual burning of the grass in the dry season. He recommended the preservation and improvement of the Palghaut Forests as a reserve to meet in after years the requirements of Government.

Farish wrote a second Minute dated 25th June, 1839, in connection with these reports. He considered that the information submitted by Williams strongly corroborated what had been assumed to be the state of the forests in his previous Minute, and that there was an obvious deficiency of timber owing to the reckless exploitation. He again advocated precautionary measures for the preservation and improvement of the forests. He considered the suggestion of purchasing the trees on the ground by the payment of the *Kooty Kunum* (i.e. the customary rate of R.1 per tree) to the proprietors was a judicious one "if no method of obtaining the royalty of the forests" as recommended in his previous Minute could be devised. But such purchase should be extensive so as to embrace all exhausted teak tracts which were situated favourably for water carriage, and to include the right of controlling the management of the forest, in order to prevent the burning of the forests and to make provision for planting and protection of young growth.

A copy of the Minute and the reports were sent to the Madras Government, and Williams was deputed to personally inspect other forest tracts.

Farish's first Minute had been sent to the Board of Revenue, Madras, and at their request the principal Collector of Malabar, now Mr. Underwood, submitted a long report on the Malabar Forests in which he reviewed at length their history under British occupation. Underwood divided his report into the heads—Royalty, Conservator, Reopening of the Timber Forests and Proposed Measures for Preserving the Forests.

On the subject of royalty Underwood drew attention to the

fact that when Tippoo Sahib took possession of the Province of Malabar, in exercise of his rights as conqueror, he annihilated private rights in the forests and created a monopoly in the forests, working them himself. From Tippoo's own statement it appeared that by this measure he gained a revenue of Rs.90,000 annually, exclusive of charges. "He, however, so far recognised the right of the proprietors as to make them an allowance of two fanams per tree of 10 inches diameter." Tippoo appeared to have first assumed the royalty of the forest in 1784-5, and Underwood argued that on the cession of the country by him the Company's Government acquired the same rights. The monopoly was re-established by the Conservator in 1806 and by the proclamation of the Madras Government of 25th April, 1807, when the Sovereignty of the Forests was assumed, and continued to 1822-3, the Conservatorship being then abolished. The forests, he argued, therefore "belonged so far to Government that their destruction cannot be permitted, as this would be an infringement of this right; and, on the other hand, they are *bona fide* the property of individuals who are entitled to the entire profits to be derived from the timber: this right has been freely exercised so as nearly to extinguish the right of Government, and it is high time that they should take prompt and immediate measures to preserve their interests from destruction by the exhaustion of the forests." On the subject of the Conservator Underwood added one fresh item of importance, namely, "that he could not discover any record that any of the Conservators had taken any steps to perpetuate the forests, as he could not discover that any of them had planted a single tree." The result of the reopening of the forests to timber traders, on the abolition of the Conservatorship, was the reckless and ruinous exploitation of the forests which followed, though very different results were anticipated, as was evidenced in the Minute of Sir Thomas Munro (the Governor who had abolished the Conservatorship). In this Minute Sir Thomas said that the merchants and agriculturists were "too good traders not to cultivate teak or whatever wood is likely to yield a profit. They are so fond of *planting*. . . . To encourage them no regulation is wanted, but a free market. Restore the liberty of trade in private wood: let the public be guarded by its ancient protector, not a stranger, but the Collector and Magistrate of the country, and we shall get all the wood the country can yield more certainly than by any restrictive measures.

Private timber will be increased by good prices, and trade and agriculture will be free from vexation." This pious hope showed a complete ignorance of the point of view of the private proprietors of forests and of timber merchants and their methods of working, and sounded the death-knell of hundreds of thousands of acres of fine teak forests.

Underwood's measures for protection were :—

Firstly, revival of the Company's right of Royalty in the forest by proclamation.

Secondly, the revival of the Conservatorship with abridged powers, the Collector to be an *ex officio* Conservator.

Thirdly, the purchase of tracts in exhausted forests with a view to their replantation.

Fourthly, that Government should work their own forests, cutting down all timber but teak, in order to replant them with teak.

Fifthly, the appointment of a joint Agent by the Government of Bombay and Madras for the purchase of timber, the Agent to be separate and distinct from the Conservator.

To obtain timber supplies Underwood suggested three methods :—

- (a) To purchase in the market.
- (b) To make large contracts, and
- (c) To purchase forests either in perpetuity or for a series of years, and so obtain exclusive rights of felling upon payment of the stipulated amount.

He advocated the last method. Underwood added, that some proprietors were already beginning to complain of the felling methods of contractors, by which young trees were cut down, and he thought that the proprietors would welcome the re-establishment of the Conservatorship.

Underwood's report is full of interest, and shows a considerable insight into the position of the Malabar Forests, and was a decided advance on the views held by his predecessor.

In reviewing Farish's first Minute and Underwood's Report the Madras Board of Revenue (November, 1839) objected to the survey of the forests as being a work of useless labour and expense, since the Government could only obtain the proprietary rights in three forests in Palghaut; on the subject of the purchase of all tracts of forest land in which teak had been totally exhausted in order to replant them the Board thought that further experience was required before they could

recommend the proposal. They also doubted whether the right of royalty after having been abandoned for a number of years could be legally revived by proclamation, and advised a reference to the legal authorities. They agreed to the other recommendations in the reports, noticing that an Agent had been already appointed to purchase timber, and they accepted the proposal that the post should be distinct from the Conservatorship.

In February, 1840, the Court of Directors reviewed the whole history of the forestry question from the date of their order of August, 1800, down to the date of Farish's Minute of April, 1839. They considered a survey unnecessary, since surveys had been carried out in Malabar and Canara in 1805-6, and though supplies of timber, reported to exist at that time, would not be applicable to 1840, yet sufficient information must have been collected to make a second survey unnecessary. The Court remarked that the Palghaut Forests in Malabar and others of considerable extent in Canara were admitted to be public property. If these were inadequate for the Government demand a properly qualified person should be deputed to select other suitable tracts of which the Government should endeavour to obtain the complete ownership. They did not approve of Farish's "royalty or forest right" proposals, as if the price of timber rose it would engender dissatisfaction among the proprietors. They considered that there would be no advantage in purchasing more land than was actually required to make provision of the Government's needs in forestry materials. The forests not required for this purpose should be left in private ownership, but they suggested that a high rate of duty should be placed on all teak felled under a certain size in order to act as a deterrent to the felling of such trees. The Court desired the Government of India to give the whole subject their early and attentive attention and to exercise their own discretion with regard to the instructions to be issued to Local Governments; but they reiterated their "anxious wish that in the prosecution of the survey, if such a measure should appear necessary, and of the ulterior operations, the utmost care may be taken to avoid any infringement of the rights or any unnecessary interference with the convenience of private persons."

This expression of opinion on the part of the Court is of high interest. Even at that distant date the Home authorities always evinced the greatest concern for the welfare of the

peoples of India, and insisted that the freedom and property of the private individual, his customs and caste prejudices, should receive the utmost consideration from officials of every degree. This has been throughout the period of British rule the guiding factor, it might be almost termed the unwritten and undeviating law, which the newly joined young official has had impressed upon him with uncompromising and unswerving directness. That the forests of the country suffered under its strict observance is unquestionable. But the damage they suffered was not due to the application of the strict letter of the law, but rather to the ignorance existing on the subject of what was the absolute minimum essential in the management of the forests to ensure their preservation. As the above Minute of the Court of Directors displays, they considered, as did the bulk of their advisors in India, that it was only necessary to make provision for the Government's requirements in timber, and that when this had been safeguarded the timber requirements of the people could be left to the forest proprietor and timber merchant. They did not recognise at that period that the interests of the Indian ryot were intimately bound up with the forestry question and the maintenance of a certain proportion of the forests, that that aspect of the question was in reality of as great importance as the provision of the timber supplies required for Government purposes.

CHAPTER VII

FOREST OPERATIONS IN THE MADRAS AND BOMBAY PRESIDENCIES (*continued*), 1840-50

THE CONOLLY TEAK PLANTATIONS

ON receipt of the Court's Despatch alluded to in the last chapter, the Government of India (April, 1840) called upon the Governments of Madras and Bombay for information regarding the Malabar and Canara Forests.

The only new matter supplied was contained in a letter from Mr. Conolly, who was acting principal Collector of Malabar. This is Mr. Conolly's first appearance on the scene, but his name was destined to become enshrined in the chronicles of the history of the forests of India. In his letter (12th June, 1840) Conolly confirms the destruction of the private forests which had been "dilapidated by a selfish and short-sighted policy," and urgently called for some measures to put a stop to their total destruction. He approved of the policy of prohibiting the felling of teak under a certain size by the imposition of a high royalty, but disapproved of the suggestion of re-asserting the Company's right of royalty by proclamation so long after its virtual relinquishment in 1823, owing to the discontent it would give rise to. He favoured the acquisition of private forests sufficient to supply the average quantity of timber required for the public service, but as the native proprietors would consider the parting with their lands as involving a loss of honour Conolly thought that the end would be "just as effectually secured by taking forests on the usual mortgage-tenure system of the country"; and by advancing nearly the value of the estate the Government could secure themselves against any intrusion, as, "in Malabar mortgages are never foreclosed, but by a common tenure (*Kooty Kunum*) the proprietor in case of redemption is bound to pay for all improvements made by the mortgagee." The

proprietary right would thus become a merely seignorial one whilst the Government would secure perpetual possession. Conolly also advocated the appointment of a Sub-Conservator with a knowledge of Arboriculture to be placed under the Collector.

The Government of Madras approved of this proposal of renting the forests, and instructed Conolly to ascertain and report upon the terms upon which the proprietors would be prepared to lease their forests to Government.

Lord Auckland, Governor-General, in a Minute (August, 1840), reviewed the reports submitted by the two Governments. He approved generally of the measures which had been taken for the preservation of the Malabar Teak Forests (though these had not yet proceeded further than the recommendation stage), but objected to measures of prohibition or to duties contrived to discourage the felling of small trees, since the older woods required to be thinned at intervals to allow more room for the growing trees. He still thought apparently that the forest proprietors would safeguard their young trees and forgo the money they could obtain from them in order that their successors might reap the benefit some eighty years or so ahead. A somewhat amazing opinion in view of the evidence before him. He, however, asked for further information on the subject.

The Government of Bombay again addressed the Government of India in this matter. Farish approved of Conolly's proposal for renting the forests by mortgages, but thought that the period must be stated, otherwise, when the forests had improved wealthy timber merchants would step in and redeem the mortgages, thus securing the accrued benefit to the forests for themselves. He supported Conolly's plea for the appointment of a Sub-Conservator under the Collector and an Agent distinct from the Conservator. He added the following interesting remark :—

" Looking beyond Indian interests in this national question I suggested that copies of these reports should be furnished to the Admiralty Board and other Departments that take cognizance of the timber resources for the Royal Navy."

In a second letter Conolly stated that although at first the proprietors had regarded his suggestion for leasing their forests with suspicion several were now prepared to entertain the idea. He estimated the amount of timber required for the public service in the Bombay and Madras Presidencies at

6000 *candies* annually, supposing one Government vessel was constantly under construction in the yards at Bombay. He estimated that 260 square miles of forest land would be required to supply this quantity, as the Nilumbur Rajah obtained nearly 2500 *candies* from his own area of forests which extended to 130 square miles. The Government of Madras authorised the Board of Revenue to request Conolly to commence making arrangements to acquire this area of forests by mortgages as opportunity offered. The Government of India was informed of the arrangement, to which it gave approval and reported the matter to the Court of Directors in January, 1841.

In a despatch (November, 1842) received by the Government of India in January, 1843, the Court of Directors reviewed the mass of correspondence on the subject of the forests and agreed to the proposals recommended up to date and the orders issued; but they could not "refrain from expressing some astonishment at the very large extent of country, no less than 260 square miles," which it had been calculated was required for public forests, the acquisition of which had been authorised. Taking 6000 *candies* or about 200 trees to be the amount of timber annually required by the Government "to supply this quantity annually, as the teak tree reaches maturity in about 60 years, would require about 120,000 trees planted in succession. We will not undertake to say with any exactness how much ground each tree should occupy, but we are persuaded that it cannot be nearly so much as 6000 or 7000 square yards, which is about the space that would be allotted to each tree if the number mentioned were scattered over a tract of 260 square miles."

This is delightful. One can picture the member of the Court trotting out to his little English home woodland counting up the trees on an acre or two and arriving at the brilliant solution above described, thus convicting the Indian Government of an attempt at land-grabbing on a wholesale scale. Though, in truth, his Whitehall descendant has on occasions in the past fallen into the same trap. It was intimated to the Court that the tropical primeval forest had but little similarity to the British woodland, and that there were a hundred other species of trees for every teak growing in the Malabar Forests, and in addition areas of marshes and grass, rocky outcrops and so forth, which were treeless or unsuited for teak in any event. The Court did not foresee the development of the Indian

Forest Service. They expressed the opinion that plantations on a much smaller scale would suffice for all the demands of the public service, and that, although to supply this both in India and England was admittedly a matter of great importance, yet there should be some limit, to overlook which in providing for the future would only be to incur unnecessary trouble, expense and responsibility.

In a subsequent despatch they considered that the timber required by Government should be obtained by contract, since that method had proved so successful in Tenasserim. The analogy was a bad one, as Tenasserim had larger untapped teak forests still extant. They sanctioned a new tariff, drawn up by Conolly, for teak in Malabar and Canara, in which the duties to be paid, especially the inland one, were reviewed and increased. Thus a first small commencement in the protection of the forests was initiated and Conolly was authorised to appoint a Sub-Conservator of Forests to work under his own direction with a modest establishment (the Sub-Conservator drew Rs.150 per mensem and the establishment Rs.51); but in addition to this Conolly obtained sanction to a temporary establishment of Rs.1735 per mensem for planting work, and with this he commenced the formation of the Nilumbur teak plantations, which have since become famous and associated with his name in the minds of every Indian Forest Officer.

The first set of rules for the working and protection of the forests were drawn up by Conolly, and it is to the credit of this gifted and far-sighted man that they remain the basis and foundation of the codes and rules of the great forest service which has grown up in India since his time.

Conolly's instructions to his Sub-Conservator were :—

(1) *To obtain a complete knowledge of the quantity and quality of timber in each forest.*

(2) *To prevent any kind of depredation being committed in the forests, whether bona fide belonging to Government or rented by them.*

(3) *To improve the forests by new planting and by unremitting attention in fostering the growth of young trees.*

The following is an abstract of the rules to this end which he formulated :—

1st. *To make circuits of the forest and prepare a register of the number and quality of trees in each, specifying as nearly as possible their age and size, their distance from water carriage and the probable number of other trees, not teak, which it may be*

necessary to remove to prevent them interfering with the growth of the young teak trees.

2nd. To prevent private individuals cutting or destroying trees of any description within Government forests and to seize and make over to the nearest police officer all who violated this order to "be dealt with according to the nature and extent of the offence committed."

3rd. To see that teak trees were carefully barked and duly seasoned both before and after felling, and that none were cut excepting under his superintendence and orders, and that for every ten teak trees cut two were left for seeding.

4th. To be provided with a sufficient quantity of seed for sowing at the proper season, to sow and plant with proper care and attention, to protect from injury of all sorts and to take proper measures for pruning and otherwise fostering them for the first few years.

5th. If the Government forests were worked by contract, to guard against injury being done to the young teak trees; also to have trees that were felled cut as near the ground as possible and to protect the shoots which spring out of the stumps of felled trees.

6th. To see that the establishment was paid regularly and that all the wants of the employees were duly attended to.

7th. To report to the Collector all instances of neglect on the part of his subordinates, using his discretion to suspend them pending the Collector's orders.

In face of the views held on the forest question at that day by the majority of the officials these were a wonderfully good set of prescriptions, and it is to be deplored that the Government did not appoint Conolly the first Conservator of Forests in S. India and give him an adequate staff to enable him to inaugurate a consistent forest policy. The inauguration of a Forest Conservancy in India would then have been hastened by a quarter of a century or more. But Conolly was never given a staff sufficiently strong to give effect to his rules *in extenso*. To the plantation work he was able to give his personal attention, as will be now detailed. He had become convinced that an energetic campaign in the formation of teak plantations was the only response to the wholesale exploitation and devastation of the forests which the past four decades had witnessed, and it was to the formation of plantations he now concentrated his energy and attention.

Conolly commenced his operations on a tract of land 25 miles in extent situated in the neighbourhood of the Beypur River.



ON THE BEYPUR RIVER, NILUMBUR
A. B. Jackson in "Indian Forester," Vol. XXXI

were sown in the manner usual with other seeds and several thousand saplings were put out ; the seed rotted in the ground without germinating and the young plantations appear to have proved as great a failure as the sowings. This want of success was ascribed to the inefficiency of the Sub-Conservator, and his other work not being considered satisfactory he was replaced by Mr. Graham. Fresh sowings were made under similar conditions, no other system being known nor at the time considered necessary, with the same want of success. Conolly then learnt from some tehsildars of the district who had been consulted that previous to sowing the seed it was necessary, in order to ensure its germination, to subject it to some process which would remove its outer coating ; but as no precise information of the process was procurable he had to experiment in this direction. Failing to attain success, he again advocated the appointment of a trained arboriculturist as Sub-Conservator. At this juncture Monsieur Perottet, a French botanist, landed at Calicut on his way to Pondicherry. Conolly invited him to visit the nurseries and advise him in the matter. Perottet carried out an investigation and wrote a detailed report, as also did Dr. Wight, who paid a visit to Nilumbur. Conolly's own experiments and these two reports are of considerable interest as showing how little was known on the subject of the sylviculture of a tree which had been furnishing the Government with their timber supplies for several decades. The reports therefore merit a brief review here.

Conolly's Experiments.—The tehsildar who advised Conolly to prepare the seed had come to that conclusion from observing that the seeds which germinated in the forests without any cultivation were prepared for germination, or, in other words, lost their outer covering (which is extremely thick) owing to the great heat engendered by the fires which annually consumed the brushwood,¹ and that therefore this process should be imitated as closely as possible in artificial sowing. Conolly accordingly had a large quantity of seeds spread on the ground in a bed and covered them with a light coating of dried grass. The grass was burnt gradually so as only to singe the rind without injuring the kernels of the seeds. The seeds were then sown,

¹ The effect of fire protection, as introduced later by the Forest Department, on the younger age classes in the Burma Teak Forests was, at a much later stage, to give rise to considerable expert controversy, this tehsildar's contention being ultimately accepted.

covered lightly with dried grass (hay is the term used) in order to protect them from the sun. Only a few of the seeds germinated.

Graham carried out other experiments. He applied fire to the seeds, but was convinced that this method destroyed the seed inside. He then threw some of the seeds into water and found that "the coating acted like a sponge and contained so much water as to convince me that the shell and seed must rot before the time usual for the seed's vegetation, which is mentioned in the tehsildar's letter to be forty days." Becoming convinced that the shell must be got rid of, Graham had 6000 cleared with the knife, and sowed them on 4th January, 1843, together with 14,000 prepared by fire. Some germinated, but the result was a failure.

M. Perotett's Report.—After making some rather inadequate remarks on the protection of the forests, which displayed an ignorance of the local tropical conditions of growth, Perotett recommended that in order to prepare the seed before sowing, the seeds should be stratified either in boxes or in damp warm soil sheltered from the sun. The process to be observed if a box was used was to place in it successive layers of earth composed of vegetable manure and seeds till the box was filled, taking care, however, that the box was not so deep as to cause the seeds at the bottom to rot. This mass was to be frequently watered for forty days, by which time it was expected the seeds would germinate, when they might be carried to suitable spots in the forests and placed in couples or triplets in holes of about two inches at the deepest and slightly covered with earth. These holes were to be at a distance of about 6 feet apart.

Dr. Wight's Opinion.—Dr. Wight did not agree with Graham's idea of removing the seed-covering with a knife, expressing the opinion that Nature gave the seed the covering for the purpose of promoting its fertility. He instanced the cinnamon seed as having a similar covering which was essential to its vegetating. Cinnamon seed, he said, was gathered into heaps and covered lightly with straw or fern, when in a few days fermentation was caused, heat germinated and the vegetation commenced. Wight thought, therefore, that instead of the teak seed rotting, as Graham supposed, when the spongy coating became full of water, the contrary would be the result, and for that purpose not only must the sponge be filled with water, but it must be kept constantly moist until vegetation begins. On the cinnamon seed analogy Wight therefore advised Conolly to try two

methods, first, by making a heap of teak seeds, previously soaked for an hour in water, and leaving them to ferment. They might then be sown in shaded beds of very light, sandy, well-moistened soil and covered with fallen leaves sprinkled over with a little soil ; these arrangements should be completed before the rains, till which time the beds should be kept moist by watering. The second plan was to throw the seeds into nearly boiling water, 180° to 200° F., and leave them there till the water cooled and then proceed as in the former case. Wight said his suggestions "were merely theoretical," but added, "of one thing I am quite sure, that much moisture is required, and I strongly suspect the heat of fermentation, which is naturally produced at the beginning of the rains, when heaps of decaying vegetation happen to be accumulated, and that it is in such situations the seeds sprout." Graham does not appear to have agreed with either of the above reports, and shortly afterwards resigned his post. Conolly again urged the appointment of an expert arboriculturist, in which he was supported by his Government, the request being favourably recommended to the Court of Directors. Pending their decision Conolly was authorised to appoint temporarily a native Sub-Conservator on a salary of Rs.50 per mensum.

In 1844, giving effect to this permission, Conolly appointed Chatter Menon to the post, and thus commenced an association which lasted till the tragic death of Conolly, who was murdered by Moplahs, the former then continuing in sole charge of the plantations till 1862. The Nilumbur teak plantations are the magnificent monument erected by these two men and by which they will be long remembered ; for, as will be shown, as this history of Forestry in India unfolds itself, almost unbroken success has followed the tentative beginnings at Nilumbur of eighty years ago.

Chatter Menon soon overcame the difficulty experienced in getting the seed to germinate, and the method adopted by him has with a few minor modifications been retained to the present day. The seed was collected in February and sown early in April, after having been soaked for forty-eight hours in water. In sowing, the seeds were covered to a depth of about $\frac{1}{4}$ inch with fine soil. On this a few small twigs were placed, and on the top a layer of straw to retain the moisture. After copious watering each day the seed germinated in fifteen to twenty days. The young plants were watered till the setting in of the monsoon, usually early in June, by which time they



TWO-YEAR OLD TEAK PLANTATION, NILUMBUR, MADRAS PRESIDENCY
A. B. Jackson in "Indian Forester," Vol. XXXI



were from 4 to 8 inches in height and ready to be planted out. The site for planting was felled during the previous cold weather, all useless material burnt and the planting pits prepared to be ready for the planting operations of June. Almost from the start of the work one hundred acres were planted annually.

In a Minute by the Marquis of Tweeddale, Governor of Madras, 8th December, 1846, the progress of the plantation work is noted upon. Lord Tweeddale visited the plantations, and his remarks on the subject of the necessity of having an expert Forester in charge who could "impart his knowledge to the natives—there is on their part no want of inclination to learn, on the contrary, there is every inclination and great aptitude," on the varied knowledge required in forming plantations, such as the suitable selection of soils, proper sowing and transplanting and subsequent thinning work, show him to have been no mean Forester himself. His Minute is therefore of all the more interest at a period when the officials in the country were so woefully ignorant in forestry matters.

At the time of his visit Lord Tweeddale found one, two, three and four-year-old plantations in existence, and was greatly struck with the efficiency of the work carried out. In assuring the Court (in the Minute) of this, he added, "I have had much experience in plantations and woods on my own account at home, as well as in those of other proprietors, but I never saw a better commencement than in the Government Teak Plantations of Malabar." In discussing pruning and thinning in the plantations, Lord Tweeddale remarked that great practical experience would be required to undertake this work. The plants generally averaged 20 feet high in the four-year-old plantations. This rapid growth, combined with the great weight of the large leaves on the stem of the last year's growth, would, he feared, result in serious breakage under sudden storms of wind unless means of checking the rapidity of the growth were devised, and he prescribed early cleanings and thinnings. The whole Minute is, in fact, a treatise on sylviculture, and in it Lord Tweeddale strongly urges that a competent expert Forester should be obtained from home to assist Conolly in the great work he had initiated. The Minute ends, "If my recommendations should be complied with nearly all difficulties would be overcome on this head, and this most valuable produce of Malabar, so abundant a source of wealth and so important to the State, would probably be

raised to an extent and brought to a perfection hitherto unknown. . . . I cannot too strongly express my opinion of the great importance I attach to fostering the plans and supporting the exertions of Mr. Conolly." The fact of having as Governor a man who, through practical experience gained on his own estates, had an acquaintance with sylviculture was of great assistance to the work Conolly was engaged upon, but it did not secure the trained forestry expert he craved for. He was left with his native assistant to work out his own salvation, and he obtained a brilliant success.

In a preceding paragraph the introduction of a new tariff for teak timber has been alluded to. Conolly had prepared a schedule on this subject. Whilst drafting this he pointed out that the Court of Directors had desired the scale of duties to be fixed, "only according to the length of the logs without reference to their breadth, which would be a mistake of the most vital importance." He quoted Williams, the timber agent, in support of the opinion. The latter had pointed out that the teak tree attains two-thirds of its extreme length before the bole acquires any considerable thickness. The object was to stop the felling of immature teak. The small teak wood sold under the denomination *khial* or *kyle* was generally 25 and 30 feet long with a diameter of about 6 inches, whereas of the entire quantity of full-grown timber brought to Calicut not an eighth part would average 25 feet in length. Trees that are half-grown, said Williams, will produce longer timber than full-grown ones, because the branches are sound and can be cut off clean and so allow of the branchy portions of the bole being taken into the timber lengths. In a full-grown tree the lower branches are hollow and the hollow runs into the bole of the trees, consequently the height of the bole is only that portion contained between the root and the part where the branches commence. Though timber of 35 and 40 feet in length (full grown) is sometimes produced it is but seldom, and not in greater proportion than 1 in 500 timbers of 25 feet and under. Again, many long and large timbers grow in inaccessible places, from which they can only be transported after being cut into short lengths. These timbers he procured for, and were best suited to, the gun-carriage factories, where length was no consideration and only great girth was required. The imposition of a heavy duty on such timber merely because it was short would be detrimental to the interests of Government.

The Board of Revenue in their reply, considering that a tariff framed on the *letter* of the instructions of the Court would defeat the object aimed at, expressed their opinion that the *spirit* of the Court's order would be best complied with by the preparation of a Schedule in which the rate of duty should vary inversely with the breadth of the timber intended for export. By this measure the duty would fall most heavily on the timber of least girth, and the practice of felling young trees and saplings would thereby be most effectually checked. In the annexed Schedule this intention is borne out by the fact that in this revised tariff the duty falls most heavily on logs, beams, planks, etc., of the least girth and width. The proposed change was only in the tariff valuation, the small timber being valued at a much higher rate per candy or kol than that of larger girth. The duty remained as before at 5 per cent inland and 3 per cent on sea export, or 8 per cent, with a credit of 5 per cent for duty previously paid inland. This tariff was prepared in consultation with Blair and Williams, and received the approval of the Nilumbur Rajah and the Zamorin Rajah. The Schedule is of some interest, as it shows the prices in force at the time, and is accordingly reproduced here (p. 100).

In April, 1844, the Government of Madras forwarded to the Government of India a voluminous correspondence on the teak forests. Part of this related to the Nilumbur teak plantation experiments already alluded to. The remainder gives information on the several points adverted to in the Despatches of the Court of Directors of the 30th November, 1842, and 19th July, 1843. This part of the correspondence contained reports dated respectively 3rd July and 30th November, 1843, from Blair, principal Collector of Canara, and Conolly, Malabar. The subjects dealt with in these reports indicate the progress which had been made in the recognition of the value of the teak forests and the necessity of conserving at least a sufficient area to provide the supplies required for Government needs. They also give evidence that the necessity of instituting a continuity of management and undertaking sylvicultural operations with a view to improving the forests both in Government-owned areas and in those leased from private owners had been grasped. The next ten years were to see these ideas become more widespread amongst officials. But progress was slow.

SCHEDULE EXHIBITING THE PRESENT AND PROPOSED TARIFF OF TEAK WOOD

Sanctioned by the Government of India on 7th October, 1843, for introduction into the Provinces of Malabar and Canaria.

Present Tariff Valuation.	Land Customs.	Sea Customs.	Proposed Tariff Valuation for both Land and Sea Customs.			Proposed Tariff Valuation on which 5 per cent Land Customs and 3 per cent additional Export Duty is to be paid.	
			Rs.	a.	p.		
Teak wood timber, viz.—							
1st Sort or above 3 candies	per candy	12 0 0	14 0 0	1st Sort or above 5 candies	•	per candy	18 0 0
2nd Sort or below 3 candies and above 32 borels in circumference	per candy	9 0 0	12 0 0	2nd Sort or below 5 and above 3 candies	•	per candy	14 0 0
3rd Sort below 32 borels in circumference	per candy	8 0 0	10 0 0	3rd Sort below 3 candies and above 32 borels in circumference	•	per candy	12 0 0
Ditto, Beams and Planks, viz.—				4th Sort below 32 and above 20 borels in circumference	•	per borels in circumference	200 0 0
1st Sort or above 12 borels width per 100 kols*		34 0 0	34 0 0	5th Sort below 20 borels in circumference	•	per log	250 0 0
2nd Sort or below 12 and above 6 borels width per 100 kols		30 0 0	28 0 0	Timber below 32 borels in circumference proved to be branches of large trees felled to be valued and passed at •	per log	per 100 kols	30 0 0
3rd Sort or below 6 borels width per 100 kols		30 0 0	25 0 0	Ditto, Beams and Planks, viz.—	•	per 100 kols	25 0 0
Reapers				1st Sort or above 18 borels width	•	per 100 kols	300 0 0
				2nd Sort or below 18 and above 12 borels width	•	per 100 kols	350 0 0
				3rd Sort or below 12 and above 8 borels width per 100 kols	•	per 100 kols	350 0 0
				4th Sort or below 8 and above 5 borels width per log	•	per log	25 0 0
				5th Sort or below 3 borels width per log	•	per log	300 0 0
				Reapers proved to have been cut out of the 1st, 2nd and 3rd sort of timber	•	per 100 kols	25 0 0

* 1 kol contains 24 borels equal to 128 inches.
A square kol is equal to 1 candy.

N.B.—Beams and planks below the width of 8 borels, proved to have been sawn out of 1st, 2nd and 3rd sort timber, will on exportation by sea be allowed to be valued as 3rd sort Beams and Planks.

Briefly, the subjects reviewed in the reports were :—

1st. The extent, situation and capabilities of those forests which were the property of Government.

2nd. The extent and condition of the teak forests obtained on account of Government from private parties, and the tenure and terms on which they were held.

3rd. The various measures which had been adopted or seemed advisable for the general conservancy and improvement of both descriptions of forests.

Blair's report went over some of the ground traversed in his 1838 Memorandum. He stated, however, that he had appointed a Sub-Conservator who had surveyed about two-thirds of the Canara Ghát Forests. From the survey it appeared that the Ghát teak forests were really more extensive than he had supposed, and that instead of 40,000 trees there were 64,141 trees, of all age classes. Of these 5367 were estimated to be fit for immediate felling and should yield 20,000 *candies*. In the other third of the Ghát area there were supposed to be 30,000 trees. Blair added that a great improvement in the management of the forests had resulted from the appointment of the Sub-Conservator. Animadverting to the remark of the Court of Directors that no considerable expense need be allowed for the Canara Forests, which were supposed to be of little value, he wrote :—

"The value of the teak forests in Canara would seem not to be duly appreciated, owing probably to the imperfect knowledge that had been obtained of them when I wrote in 1838." He considered that they were of considerable value, since "it appears that the greater portion of the trees on the areas already surveyed may be transported to the banks of neighbouring rivers or nullahs without any considerable difficulty. . . . With regard to the quality of the Canara timber it is considered by the natives to be superior to that of Malabar, being harder and containing more of the oily properties of the teak." The teak forests in Lower Coorg which yielded a small quantity of stunted dwarf teak were mostly claimed as private property by the ryots, though Blair considered the claim to be questionable. On the subject of extraction he considered the contract system cheapest and approved of the revised tariff.

In Conolly's report a general review of the ownership of the forests of Malabar is given. The sole new point was in connection with the only Government-owned forests, three in number in Palghaut, situated within eight miles of the

town of Palghaut, their area being twenty-five square miles in extent. They had been placed under the Talook authorities, no special establishment being considered necessary. Williams had felled all the mature teak, six hundred trees, and only immature trees now existed on the area. Conolly proposed to extend his sowing operations to this area and fill up all blanks.

On the subject of the acquired forests, i.e. those obtained for Government from private parties, Conolly stated that these consisted of the tract of woodland of about fifty square miles in extent obtained from the Tricaloor Devassom, "sometimes styled Numbidi," and an extensive forest rented from the Zamorin Rajah. Four forests, the purchase of which had been sanctioned by the Government of India in 1842 for Rs.15,000, had not been taken up as there was supposed to be a flaw in the title-deeds. Later this was denied, but on Conolly's advice the areas were not purchased "in consequence of the supplies of timber in the forests of Canara and in Malabar, which were the property of Government, as well as in the forest of Goozerat (to be mentioned later), having been found to be greater than was first supposed, and as the cutting of immature trees and the reckless devastation of the forests generally had been checked by the revised tariff, so that larger quantities of full-sized timber were expected in the market from which the Government could always secure what they required."

The area obtained from the Tricaloor Devassom was on mortgage for Rs.8000, which sum was to be held without interest and to be gradually liquidated by the stump money, or fee of one rupee (*Kooty Kunum*) on each tree felled. Thirty-five miles of this tract consisted of heavy forest situated at the foot of the Wynnaad Hills beyond Nilumbur; the area was formerly forest land and lay on the west or Calicut side of Nilumbur, some alterations in the boundaries of the latter area having been made with the consent of the Nilumbur Rajah. This was one of the areas which Conolly intended planting up.

The forest rented from the Zamorin Rajah, "of considerable extent," was situated in the heart of the Ernaad Valley near Carcoor. The terms of lease were the payment of the usual *Kooty Kunum* for each tree felled, which was considered to be very favourable to Government. There were only a few trees fit for felling in this forest, as "almost every piece of timber

that could fetch any price in the market " had been cut and carried away "in the last few years, and much of it surreptitiously." But Conolly had no doubts about its future recovery and value. He had " induced eight hill slaves, or *Adairs*, to take up their residence in the forest to preserve it from future depredations, on a promise of protection and support," and he requested sanction to a monthly disbursement of Rs.20, to enable him to pay these men " on an average of Rs.3 a head, or for the eight Rs.24 per mensem, but some part of this will be realised by the sale of honey, wax, and other hill products which are found in the forest, and the collection of which forms one of the chief occupations of the *Adair* class." The men were to be inspected from time to time by the Sub-Conservator and his establishment.

This mention of the sale of "honey, wax and other hill products" is the first allusion apparently extant to the collection of what the Forest Department terms "Minor Products." These products of the Indian Forests now produce a very considerable revenue, a revenue built up from the modest beginnings above described.

The reference to the sums disbursed in payment to the *Adairs*, as also those spent on Conolly's staff, indicate how from the outset in the history of the first beginnings in the management of the forests great reluctance was evinced on any outlay on staff, protection and so forth. And this Shylock spirit pervaded the whole of the officials, from the Court of Directors downwards. It was an unfortunate commencement; for the spirit persisted for well over the ensuing sixty years and handicapped and retarded the activities and growth of the Forest Department, impeded the more rapid opening out and exploiting of valuable forest areas, and seriously checked the growth of the revenue obtainable from this great estate. That Conolly had grasped at least one side of the question (it is not apparent that even he had realised the necessity of paying an adequate wage and thus securing the best type of man) is evidenced by the following extract from his Report: "It was absolutely necessary that Government should come forward and take the initiative in the formation of new forests to replace those which have vanished from private carelessness and rapacity. A work too new, too extensive, and too barren of early returns to be ever taken up by the native proprietor."

This last sentence was penned nearly eighty years ago, and

yet it might have been written to apply to the afforestation question in Great Britain to-day.

In 1844 Williams, the Timber Agent at the Coast, submitted an interesting, if dubious, report on the timber trade. He stated that the season had been a very unfavourable one, that the supplies of large timber had been very small, due partly to the new tariff (though it had only been lately leviable), but chiefly to failing supplies owing to the exhaustion of the forests situated near water transport. With reference to the new tariff he wrote : " Notwithstanding that the duties have only very lately been officially levied the intention of Government to impose them was known long previously, and every effort made in consequence to bring down small timber (in preference to large), so long as the opportunity remained open of doing so unrestrictedly." Even the Nilumbur Rajah could not resist taking advantage of the last chance of sending down small timber at the old price, for Williams says : " There has, however, been a great falling off in the character of the Nilumbur timber during this season, in consequence of the endeavour to bring down the greatest possible quantity of small timber before the time when the prohibitive duties would render it unsaleable."

Williams was beginning to have to face competition from English Commission Agents buying for the English market. He wrote of them that " during the last two seasons they have purchased some six thousand candies of large timber for which, although the greater part of it was of inferior quality, they have had to pay very dearly. Of this wood two thousand candies have already been sent to England ; the remainder is under shipment : it is intended for the use of private parties at home who have contracted to build a number of steam vessels, certain parts of which it is stipulated shall be constructed of East Indian teak." In the same Report he remarks : " The Arabs, whose extensive dealing used formerly in some measure to influence the market, have this year given up the purchase of teak timber in favour of Agency, which they now consider will answer nearly as well for the planking of their buggaloes."

He advocated the employment of a qualified person to select proper trees for felling, and to arrange in what manner they should be trimmed before being brought from the forests, as well as to select standing trees likely to yield timber for dockyard purposes, that the same might be girdled preparatory

to being felled during the following season. The Government of India kept the latter suggestion pending until they had received the reply of the Court of Directors on the subject of the appointment of a trained Arboriculturist.

Conolly managed to obtain an increase of his planting establishment sanctioned by the Government of India in 1845, the aggregate cost being raised from Rs.221 to Rs.314-8, including Rs.50, the salary of the native Sub-Conservator, Chatter Menon. In view of the excellent results obtained the monthly disbursement appears absurdly small.

The Timber Agent had the following establishment in 1845: 1 English writer, Rs.20, 1 Measurer, Rs.7-8, 3 peons, each Rs. 5, Rs.15. Total per mensem, Rs.42.8.

The establishment and expenses of the Timber Agency at this period were :

	Rs.	a.	p.	Rs.	a.	p.
Captain Williams, Agent	1000	0	0			
Office rent	50	0	0			
Mr. Poulten, Assistant	50	0	0			
Batta	60	0	0			
Travelling allowance	60	0	0			
				1220	0	0
Calicut Establishment		167	8	0		
Beypur Establishment		35	0	0		
Poonany Establishment		54	8	0		
Forest Establishment		50	0	0		
Palanquin allowance and Head Money to Civil Surgeon of Calicut		33	0	0		
Total per month	1560	0	0			

In addition Williams was allowed to charge his travelling allowance incurred in visiting the timber stations. In 1847 the Government of India increased Mr. Poulten's salary to Rs.300 per month, "but the Court of Directors, in their Despatch No. 1 of the 27th February, 1849, disapproved of the arrangement."

It is almost incredible, and perhaps accounts for the slow progress made in the economic development of India, that the Court of Directors should have retained within their own hands the power of vetoing a hard-earned increase of salary to a humble clerk, which had already been sanctioned by the Government of India !

Owing to the shortage of timber supplies in 1844 Williams turned his attention to the Coimbatore Forests. It was due to this fact that these forests are mentioned in the correspondence at this date. Williams applied to the Collector of Coimbatore for permission for his contractor to work the teak forests of "Anna Mâla" (Anaimalai), on the condition that all timber cut should be exclusively for the public service. The Collector, Mr. Wroughton, stated in reply that some "restrictive orders of Government" prevailed in the District which disallowed the felling of timber in Coimbatore without the special sanction of Government. Williams referred the matter to the Government of Bombay, who referred it to the Government of Madras, and the latter Government called upon Wroughton for a report. In his report of 14th September, 1844, the latter opposed the idea of any outside contractor working the Coimbatore Forests, but said that local arrangements could be made to meet the demands of the Bombay Government to any extent, and he recommended that a Superintendent or Conservator should be appointed, assisted by a competent establishment. The Board of Revenue agreed to this proposal, and suggested that the transport of the timber to the Western ports should be effected by contract, thus giving effect to the wishes of the Court of Directors in this respect. The Government of Madras approved, and Wroughton was ordered to start the work and recommend his establishment. The latter visited the "Anna Mâla" Forest in November or December, 1844, but found that there would not be water enough in the streams to float out the teak before the south-west monsoon in the following May or June. He therefore directed his attention to the Wallair Forests, and as they contained from four to five thousand trees suitable for Government requirements and situated near to water carriage he decided on working them. The establishment he applied for, including a native sub-Conservator on Rs.100 per mensem, amounted to a monthly charge of Rs.246, together with an advance of Rs.15,000 to meet the expenses for felling, barking and the carriage of the timber. The establishment and advance were sanctioned by the Government of India in July, 1845.

The question of working the Coimbatore teak forests was again taken up in May, 1847, Captain (later Major-General) F. C. Cotton submitting a report on the teak in the Anaimalai Hills to the Government of Madras and asking for the services of an officer to explore the forests. The sanction of the

Government of India having been obtained to this proposal Lieutenant (later Major-General) J. Michael was appointed in June, 1848. He commenced an exploration of the forests of the Anaimalai Hills and submitted a report on their teak-bearing possibilities, stating these to be considerable.

In August, 1849, the Court of Directors called for reports on the result of Michael's work. The terms of the despatch are well worth recording, as evidence of the just views now being entertained by the Court of Directors. They wrote: "We trust that effectual measures will be taken for its conservation (i.e. the Anaimalai Forest), so as to protect it from the serious injury which other forests have sustained."

Cotton then submitted a report on the operations of felling and converting teak, the making of a road across the hills, and the settlement of the Colengode and Cochin boundaries.

About the time when Cotton first drew attention to the Anaimalai Forests a young assistant surgeon in Mysore, by name Dr. Cleghorn, was interesting himself in the forests of Mysore. Cleghorn was destined to play a great part in the inauguration of the Indian Forest Service and in the drawing up of a policy of Forest Administration in the country in the future, and became the first Conservator of Forests in the Madras Presidency. This is his first appearance on the scene, and he made his débüt on the forestry stage in the following manner. In 1847 Cleghorn was stationed as assistant surgeon at Shimoga, in the Nuggur Division of Mysore. Being interested in botany and a keen observer, he made notes on the wholesale destruction of the forests in that district, chiefly through the *Kumri* cultivation. It was mainly through his representations that the attention of Sir Mark Cubbon, then Commissioner of Mysore, and of Colonel Onslow, the Superintendent of the Nuggur Division of that State, was drawn to the necessity of Forest Conservancy. Cleghorn's name was mentioned in a report on the Conservation of the Forests, which Onslow submitted to the Commissioner in May, 1847. In his *Journey through Mysore in 1800* Buchanan had noted that extensive forests of teak flourished throughout the province. These had wellnigh disappeared in 1847, and Onslow stated that the Government had derived but little benefit from it. Vast quantities of timber of all kinds was yearly being sent down the rivers by the farmers of the forests or the people who paid them a small sum for cutting it. And enormous areas had been destroyed by the *Kumri* cultivation. In consequence of

this report and of Cleghorn's representations *Kumri* cultivation was stopped in the greater part of Mysore and Coorg, with the result that twenty years later (according to Brandis himself) large tracts of country were clothed with well-stocked young forests which had grown up (with the advent of a Forest Department and Forest Conservancy) on the old *Kumri* clearings.

The following extract from a letter from a Captain Harvey at this period is illuminating as to the waste of valuable timber : " I will mention what I discovered at Hyderabad. I was in want of light-coloured wood for picture-frames, and applied to the regimental contractor : what was my surprise to find that every third or fourth log in his great store of firewood was most beautiful satin-wood of large size ! Only imagine the victuals of a whole regiment, not to say of a large community, being cooked with satin-wood ! "

Allusion has been made to the Goozerat Forests. Before dealing with the history of the Bombay Forests, between the years 1843 and 1849, the attention paid to the former may be briefly glanced at. The only records which appear to be extant for the period here reviewed are confined to the years 1841 and 1842. In 1841 the Government Timber Agent at Surat, Mr. Boyce, having experienced difficulty in procuring good-sized timber for the Government of India, resolved to visit the forests with a view to ascertaining the distance of the principal forests, the nature of the roads and obstacles to transporting the timber, the quality and abundance of the timber, and the possibility, if any, of floating it out. Mr. Boyce visited the Karribell Forest only. There were others, but this was the most important. It was under the control of a Bheel Rajah named Ooda-Singh. In the outer parts of the forest the teak were poor and scattered, but the further he penetrated the larger and more numerous became the trees. From his inspection Mr. Boyce wrote : " Forests producing splendid teak extend north and south from the southern bank of the Tapti River, in the Beara Pergannah, to the territory of the Bamsda Raja. Other forests continue to the southward, but owing to some peculiarities of soil, the trees after attaining a moderate size become hollow ; this is particularly observable in the timber obtained from the Dhurrumpore Forests." A great deal of timber was also obtained from Peepree and Rhamboj, which were also in the Bheel districts, but Mr. Boyce did not visit them.

On the subject of the wasteful utilisation of the timber in force at the period Mr. Boyce instanced the following :—

His attention was drawn to several large blocks of fine teak timber 4 to 5 feet in length and 2 feet and upwards in diameter lying close to the stumps of newly felled trees. He discovered that the coolies felled the trees without first branching them, and then cut off a piece at each end to reduce the trunk to the length most convenient for being carried ; they then with axes chipped down each end of the log to reduce it to a convenient weight and thus wasted at least one half of a valuable tree. This confirmed his opinion that all the first sort of timber brought down had been originally double the size. He objected to the method of getting the timber down by bullock-carts, and thought it should be possible to make the rivers practicable for floating. He therefore proposed in order to get a plentiful supply of good timber that these practices should be checked, that the transport facilities should be improved, and, lastly, that arrangements should be made direct with the coolies or ryots for supplies without the intervention of the dealers ; or if one of the principal dealers was enlisted on the side of Government by the offer of a liberal salary or other consideration, this would ensure the services of all the coolies hitherto employed by him, "and that being secured timber equal to what was sold in Bombay for 16 and 18 rupees per candy might be purchased at the bunders for 12 and 13 rupees per candy, new measurement, a saving which would enable Government to entertain any extra establishment which this new system would require."

Mr. Boyce's suggestions were submitted by Sir Robert Oliver to the Government of Bombay in June, 1841 ; he suggested that the political officers should be asked to exert their influence with the native chiefs to protect their forests. In regard to the supplies of timber Sir Robert stated that in his opinion open competition was the best method of obtaining them, "unless the Bheel Raja can be induced to give the preference of his supplies to Government." The Government of Bombay forwarded this correspondence to several officers in the district concerned for opinion as to the methods they would propose for securing to Government a direct supply of timber from the Northern Forests. These officials in reply said that the matter was a complicated one ; that little information was available on the subject of the forests, some of which were leased to farmers, and that it would be necessary to consider

the means by which such could be restored to their owners ; enquiries would also be required on the mode of procuring the timber and on the obstacles existing to its transit.

In the meanwhile it was discovered that the Karrabell Forest had been leased for a period of six years, from 1836, for the small sum of Rs.2000, and it was recommended that the Government should extricate the proprietor, the Bheel Rajah, from the hands of the farmers of the forest and money-lenders to whom the estate was mortgaged, and conclude an arrangement equally advantageous to him and to the Government. As the season was now far advanced (August, 1841) they recommended that Mr. Boyce should be allowed to try his plan, as they did not agree with Sir R. Oliver's view of an open competition, saying that all the dealers were banded together and would make every effort to defeat any attempt to reduce their profits. The Government of Bombay, in September, 1841, sanctioned for one year the introduction of Mr. Boyce's plan, and this was reluctantly endorsed by the Government of India, who asked to be informed at the end of the year of the results attained.

In April and June, 1842, the Government of Bombay addressed the Government of India and submitted a long correspondence on the subject of the arrangements made by Mr. Boyce with the owners of Karrabell, Peepree and Rhamboj Forests for securing to Government the right to all timber in them, but no report was sent in as to the result of Mr. Boyce's efforts to obtain timber direct from the coolies and ryots instead of through the timber dealers.

It is interesting to note that the Karribell Forest was leased to Government for an annual payment of Rs.2300, the Peepree Forest for an annual payment of Rs.1800 and the Rhamboj Forests for an annual payment of Rs.850. These terms were considered very favourable as, "independently of the unlimited supply of fine teak timber which they contained, there was a variety of other valuable productions from which revenue was derivable. These were described as Tunnus timber, Huldaree timber, sandal-wood, blackwood and bamboos and other seeds ; in addition the following very expensive drugs, in great demand in the native pharmacopeia, viz. Moordar Singh, Kaphul, Jerkuchurah." On the subject of the bamboo it was noted that "the bamboo bore at certain seasons a description of seed which was eagerly sought by the natives, and realised a considerable sum : it resembled wheat,

and when ground made a delicate kind of bread." The fact that the bamboos flower only at long and varying intervals and then die was apparently unknown at the time; or the officials would not have counted on a certain revenue from this article. Mr. Boyce was, however, a man of some knowledge. For the report continues: "It was supposed that a careful examination of the forests would disclose other productions of value from a commercial as well as a scientific point of view, and at the same time allow of a large quantity of land within this limit being brought into cultivation." To this end Mr. Boyce intended to make a survey of the country leased to Government. Mr. Boyce was appointed Timber Agent and Conservator on a salary of Rs.700 per annum and given an establishment including an Assistant Conservator, the appointments receiving the sanction of the Government of India. This had all the appearance of a very promising beginning, but no further correspondence appears on the subject in the India Office records available.

As regards the other Bombay Forests some interesting information is extant from the years 1843-50. Enquiries into the condition of the forests had been undertaken by the Bombay Government as early as March, 1840, when Dr. Gibson, Superintendent of the Botanical Gardens, was directed to visit the forests and report on their resources and on the best means to be adopted for their preservation and improvement. In 1841 Gibson made an inspection of the forest tracts near the coast in the Northern and in part of the Southern Concan. In 1842 he undertook an experimental thinning of part of the teak forests in the Rutnagherry Collectorate. The following year Colonel Jervis, the Chief Engineer at Bombay, in his capacity of Member of the Military Board, wrote a Minute (9th December, 1843), giving a brief account of the situation, extent and condition of the Bombay Forests in 1843. This Minute is of such interest as an historical record of the position of the forests at that time that it is reproduced here:—

"On the eastern skirts of the Goozerat Province, from Deesa downwards to the Nerbudda, are forests of varying breadth. These forests are the broadest and the trees in them the largest where the country stretches towards Malwa. The more useful timber in these tracts are chiefly Pullus, Sissoo, Tunnus and Mhowa. The whole tracts of these forests were

said to belong to thakoors and petty Rajas, some independent, but most feudatories of the Gaekwar.

" Crossing the Nerbudda are the Rajpeepla Jungles, a wide broad range which was imperfectly known. They stretch upwards towards the Lautpura range, thinning as they approach the Taptee. Teak is found here in addition to the woods mentioned above.

" Above the Ghauts leading to Kandeish are some teak forests, but the most extensive portion is below, in the hilly and jungle tract skirting the Surat Districts.

" Southwards of this is Shroongana, containing a good deal of teak.

" Westwards are the Dhurrumpore Raja's jungles, where teak was formerly plentiful, but the quantity has been much reduced.

" Next came the Dumaun Jungles, where teak was mostly preserved, but it was not plentiful, and cuttings for ship-building had been large.

" Proceeding south to the Pith and Hursool country, lying eastwards of Gumbeer Ghur to the Ghauts, teak was formerly very extensive, but had largely been cut away, chiefly for export to the Dekhan. It is sent even as far as Dholapoort. By proper care and conservation it was expected that this tract would soon yield large supplies.

" Thence crossing a *wag nuddee* into the territory of the Jewar Raja, which extends southwards to beyond Boputghur, much teak was formerly grown, but in 1843 it was very thin, having been disposed of mostly by contract, to persons exporting it to the coast.

" From this part commence the jungles of Kolwun, forming the north-east corner of the Tanna Collectorate. Here teak is inferior in size and straightness to that of Jewar or Hursool. It has been mostly cut away, leaving merely stumps and crooked shoots. There is also in these Kolwun Jungles much valuable wood of other kinds fitted for building, &c., such as Hedoo, Bibla and Kulum. Sissoo is sparingly found here and of small size.

" The hills stretching westward from Doogaur and Vijirabhoy to the sea were formerly covered with wood, but in 1843 on their sea face, there was hardly a bush to be seen ; all had been cut away for the Bombay market.

" In Salsette there are some small plantations preserved, but of these the greater part are in villages which had been gradually acquired by Parsees.

" Southward from Kolwun, as far as Aptie, the country is mostly bare, with the exception of a strip of jungle extending from Bhewndy by Potgaum, Bowmullum, &c. In this are many remains of what have been good teak trees, but they are now chiefly shoots from stumps.

" Beyond Aptie is a good deal of teak, formerly planted and conserved by the Angria family. This extends eastwards to near Jamboolpara, and formed a large source of supply for the Poona market. In 1843 the trees were not of great size.

" In the talooks of Nagotna, Bohee Goregaum, Nizampore, &c., belonging to the British Government, there is a good deal of teak. In many villages such as Putwoos, &c., it has been long preserved, with the exception of the cuttings allowed by the Collectors and their assistants and by the kamavisdars. Formerly a man petitioned for leave to cut down trees for a particular purpose, chose the best, and through connivance of inferiors helped himself most liberally. This in a great measure tended to the destruction of the forests.

" Further west in these talooks the teak wood seems to have been cut down annually for burning in the fields. Since the stoppage of teak cutting three or four years before 1843, under the orders of Government, the hills have become covered with thriving young teak trees, which in the course of ten or fifteen years may be expected to afford a large source of supply for smaller wood, applicable to the houses of the people.

" On the Bankote Creek there were, in 1843, several plantations of teak.

" In ten or twelve villages of the Ryeghur talook are rather extensive plantations, just beginning to recover from the cutting formerly allowed under the contract system, which permitted a man, on paying a certain sum, to have the privilege of cutting within certain boundaries for so many years. This is the system which has been already so often condemned.

" South of Latwun Khind, and from thence to Vingorla, the villages being entirely on the *Khote* system, that is, under the management of a hereditary renter, exempt from control as to the interior economy of the village, the intentions of Government for the preservation of teak could not be carried out. Hence in this forest tract there is little teak to be seen, as it is cut away along with the brushwood for burning in the fields. Nevertheless in this tract are two extensive plantations formed by the Angria family. One tract lies in ten villages of the Severndroog talook, in which the teak is said to have

been nearly all cut away when Mr. Pelly was Collector of Bankote. The trees now (in 1843) existing are thriving shoots from the old stumps. In this tract, however, the teak of late has considerably propagated itself by the fall of seeds, and the plantations are now regularly conserved by the Collector's establishment. The other tract is situated north-east of Malwan, between that port and Ramghur. It was cut down under the contract system some fourteen years ago, and the present trees are mere shoots. The soil here is better than that to the northward ; the trees are consequently more luxuriant.

"Regarding the forests lying east of the ridge of the Western Ghauts, and south of the River Nerbudda, it is stated that a large tract of forest extends from the longitude of the ridge along the valley of the Nerbudda and southward as far almost as the immediate banks of the River Taptee to the very source of these rivers.

"Next come the plantations south of Songhur, scattered, and of little account for external commercial purposes, but capable of being turned to profitable use if conserved, so as to secure a succession of cuttings, all of which are applicable to increase the comfort of the dwellings of the people, and this is of the more consequence here, as the country is otherwise bare of wood.

"In the upper part of the Gor River the hills are steep, and afford excellent protection for young teak trees. Accordingly it is to be found that they had formerly been planted in all this valley by the provident care of Nana Furnavese and others. They have unfortunately been subjected to a destructive process of thinning, owing to the payment of the expenses of conservancy being made to depend directly on this source. Hence the best shoots have been annually cut away, and only the worst left. The cutting has been lately stopped, and since this young teak plantations have sprung up in five or six other villages of the valley. There can be no doubt but that teak seeds scattered in many such valleys above the Ghauts might, with very little trouble, form the basis of extensive plantations that would prove most useful hereafter. And it should be borne in mind that teak seeds vegetate only when scattered on the surface, but not if regularly planted in the soil.

"At Chas Kuman under the northern face of Singhur are plantations, rather extensive, thriving and well kept. From the leaves of these (used for thatching at Poona) a considerable revenue is derived, and the grass fostered by the shadow of

the trees attains a larger size than it does on the open hills or plains, and its value (near a populous city) is thereby proportionally enhanced.

"Southward in the country of the Punt Suchew and in that near Sherwul, west of Poorundhur, are many plantations on the hills, but it does not appear that they have ever been allowed to reach any size, though the nature of the country (valleys shut in by steep hills) is favourable for their growth.

"In the southern Mahratta Country, west of Pelgaum and Dharwar, are forests believed to be extensive, and showing by their luxuriance of growth the superiority of the soil and that the climate is eminently fitted for them. From specimens of the wood of these forests lately brought to Bombay it would appear that the timber is equal, if not superior in breadth and quality, to that of Malabar.

"All the teak forests mentioned contain also a variety of other timber-trees, which are very useful in particular departments of public works. The shewun is valuable for its lightness and flexibility, the sissoo for its dense fibre and consequent strength to support heavy weights or resist friction, and there are other woods useful to the turner, the wheelwright and modeller."

The above report furnishes evidence of the fact that Colonel Jervis not only possessed a considerable acquaintance with the forests of the Presidency but, so far as the reports and correspondence extant afford evidence, was one of the few to point out that the forests should be conserved not only for the primary object of providing timber for the Government purposes, but also in the interests of the agrarian population who inhabited the tracts in the neighbourhood of the forests. The report also forms a valuable record of the state of the forests in the tracts dealt with at the period for which it was drawn up.

It becomes evident from Jervis' Minute that no care was taken of the forests of the Bombay Presidency previously to 1840, but after the appointment of Dr. Gibson, in March of that year, to examine them and suggest means for their preservation and improvement, the Government of Bombay, acting probably on that officer's advice, appear to have made some endeavours to protect the forests. The measures adopted failed however, owing, it was stated, to the want of unity of superintendence, as under the plan pursued one part of the

forests was under the Military Department, another under the Political, and a third under the Revenue Department, without there being any immediate controlling authority. In December, 1843, the deteriorated condition of the forests, and the difficulty of obtaining good timber, attracted the notice of the Military Board of Bombay, which resulted in Jervis preparing the above recorded Minute. In this and two other communications he made several valuable suggestions for the care and conservancy of the timber forests. The Military Board took up the matter and recommended the Government to organise an establishment under a qualified person, for the conservation of all the forests, and applied to be vested with the whole control and management of them, on the ground that "each department of Government requiring supplies of timber, whether Public Works, Ordnance or Shipping, has in some one of the persons, either of the Members or of the Secretaries of the Military Board, its appropriate representative."

It is difficult to conceive, apart from the well-known fact that every Department of State endeavours to keep as much of the machinery of government, and consequently power, in its own hands—it is difficult to conceive how the Military Board could have justified to itself its suggestion to be vested with the whole control and management of the forests. It is true that they were very closely interested in the utilisation of the timber, and that it should be extracted by the best methods and with the least amount of damage to the timber itself. But Jervis' Minute of itself shows that he understood that the mere extraction and utilisation of the products was but one side of the matter, and that a comparatively small one, compared to the work of far greater magnitude which the proper conservation and management of the forests in the interests of the country and whole community involved. Little as this issue was realised at that day the first glimmerings of this great necessity were beginning to frame themselves on the vision of the more far-sighted officials, and it would have been of very considerable interest to have on record Jervis' private opinions of the Military Board's suggestion. For it must have been obvious to him that the Civil or Revenue Department, closely associated with the government of the people out in the districts, must inevitably be the Department under which the management of the forests would ultimately fall.

The Bombay Government temporised. They first called for a return of all persons who drew any salary or derived any emolument from the management of the forests; unfortunately this return has not been traced in the records of that time. The Military Board were then asked to submit a scheme for the establishment of conservancy under Dr. Gibson. They complied, recommending that Gibson should be appointed Conservator without relinquishing his appointment as Superintendent of the Botanical Gardens. In a subsequent letter (April, 1844) they further suggested that Gibson, in his capacity of "Interim Conservator," should be employed to carry out the views proposed by the Board for the preservation of the forests. It is supposed that the title of "Interim Conservator" was adopted owing to the fact that it was known that application had been made to the Court of Directors to appoint a trained Arboriculturist, and that if given effect to the latter might arrive in the country with full powers to take over charge of the forests of both the Bombay and Madras Presidencies. The information which had been collected by Gibson on his tours, and the results of the experimental thinning of the forests already referred to, were such as to induce the Government to take into consideration the propriety of permanently appointing an officer for the general conservancy of the forests, whose duty should be to enforce a regulated system for felling timber, and to consider the means for preventing a decrease in the supply of firewood and building timber, throughout the Presidency. They recognised the desirability of having a department with a recognised status free from the complications which had arisen from the divided authority; pending such a settlement of the question they directed the Military Board to enforce such general measures as involved no particular outlay and could be superintended by the local officers, with the occasional aid of Gibson as "Interim Conservator," until an active and efficient system could be introduced with the sanction of the Supreme Government. In November, 1845, the Government of Bombay submitted the whole correspondence to the Government of India, with a letter detailing in full their views and intentions as regards the management of the forests. In that letter and correspondence the Bombay Government explained the urgent necessity for the establishment of a supervising agency, and they asked the sanction of the Supreme Government to the appointment of a Conservator, with a

small office establishment, including an Assistant Conservator on Rs.200 per mensem, at an increased cost amounting to Rs.3576 per annum on the then existing charges. This increased charge, it was estimated, would be defrayed by the receipts which might be calculated to accrue from the sale of the thinnings of the forests, after deducting the actual charge for cutting, and it even considered that the receipts in the first years of the Department might be reasonably estimated at Rs.5000.

In March, 1846, in reply, the Government of India enquired whether the conservancy measures were intended to apply to Government forests only, or were to be extended equally to forests not the property of Government, and whether the duties of Conservator were to be confined to the forests of the Bombay Presidency only or to be extended to the forests on the western coast of the Madras Presidency; and if the latter, whether the Madras Presidency had been consulted and had approved. The Bombay Government replied that although the conservative measures had mainly in view the Government forests yet they proposed that the Conservator should enquire into the claims of ownership of areas of forests in secluded localities, not yet dealt with; it was also intended, where possible, without political inconvenience or injustice, to apply the proposed conservancy arrangements to all forests belonging to independent chiefs, of which description there were many. With reference to the enquiry concerning the Madras Forests the Bombay Government had not addressed the Madras Government on the subject, but thought that it would be to the public advantage if the Madras Forests were included in the Conservatorship.

On December 19th, 1846, the Government of India authorised "the employment of an establishment for the management of the forests under the Bombay Presidency, at a monthly charge of 293 rupees," and on 22nd March, 1847, the Government of Bombay appointed Dr. Gibson Conservator, in addition to his appointment as Superintendent of the Botanical Gardens, and authorised him to entertain the establishment which had been sanctioned by the Government of India.

This modest beginning was the first step towards the inauguration of efficient management into the Indian forests, the appointments made being the first "Conservator" and "Assistant Conservator" gazetted in the country, the fore-runners of the great service which was to follow.

It had taken nearly half a century to arrive at this point. It was stipulated that the Conservator's charge should not include the timber depots which had been formed many years previously at Calicut for the purchase of teak for the Bombay Dockyard, nor were the timber stores at the latter place placed under the Conservator. Gibson was appointed under the immediate orders of the Military Department, and the latter were requested to draw up rules for his guidance. These rules appear never to have been submitted, and Gibson seems to have been left to exercise his own judgment and discretion in giving effect to the objects Government had in view by his appointment.

The districts over which Gibson's control as Conservator extended were the Northern and Southern Concans, and the Collectorates of the Deccan and Southern Mahratta country, as also the forests in Surat and the Dangs ; and, in 1847, the forests of Sattara were placed under his management.

Having settled their new Forest Conservancy Staff the Bombay Government, in February, 1848, communicated the arrangement to the Madras Government and suggested the transfer of the Canara and Sondah forests, north of the Gungawallee creek, to their supervision with the view of placing them under Dr. Gibson. When we reflect on the reception such a proposal would have met with in India sixty years or so later, it will create little surprise that the Government of Madras "did not approve of such an arrangement." They were, however, quite ready to take full advantage of Gibson's experience and would welcome visits and advice from him which they would give strict attention to. The suggestion was officially sanctioned and Gibson appears to have visited Canara on two or three occasions and to have reported at length on the forests inspected, recommending the planting of certain tracts and the protection and preservation of other tracts in the northern part of Canara. For these purposes the Government of India, on 21st October, 1848, sanctioned an addition to the existing forest establishment in Canara to the extent of Rs.180 per mensem.

One of the reasons which influenced the sanction of the extra staff in Canara was doubtless the views, which make their appearance for the first time in the official memoranda on the forestry question, put forward by Mr. Blane (the successor to Blair as Collector of Canara) and Gibson. The correspondence submitted by the Government of Madras with reference to

making use of the services of Gibson as adviser contains several letters from Blane. In these letters he discusses the conservancy of the forests generally and the right of Government to all such forests as could not be clearly established to be private property, which right the Government of India subsequently upheld, empowering him to "assert the rights of Government to all forest-lands to which a title could not be clearly established by private individuals." These matters have been already dealt with. But Blane introduced into the correspondence two new points which do not appear to have received any previous consideration. The *first*, the effect which the extensive clearances of woodland had upon the general climate and fertility of the country, the *second*, the necessity of restricting *Kumri* (i.e. shifting) cultivation.

On the subject of the effect on the climate from the extensive clearances of woodlands, Blane and Gibson quoted authorities to show that the climate of a country was very much modified by the clearing away of the forests. In Canara, where the clearances had been rapid and extensive, it was alleged that much less rain had fallen than in former years, when the country was covered with woods; whence it was supposed that the gradual filling up of the mouths of the large rivers, which was observed along the whole length of the coast, was in a great degree attributable to the decreasing body of water which flowed from the upper country, and by the force of which the silt was previously carried into the sea, and the channels of the rivers kept deep. To show the rapidity with which the woodland in Canara had been destroyed, it was stated that within thirty or forty years the forests had receded from the coast to within a few miles of the Ghâts, and large tracts of country were instanced which were formerly within no distant time covered with wood, but which now had hardly "a stick large enough for firewood." This destruction had been carried on to such an extent in the neighbourhood of Mangalore "that the article of firewood, formerly so abundant, is now one of the chief items of expense to the poorer classes of people and is a deprivation severely felt by them." Many causes had contributed to bring about this scarcity, but the chief was "the improvidence with which the wood was treated, every tree and bush being felled at first, and the shoots and saplings which would have grown up and supplied their places being cut down every year until the roots die off, leaving nothing

but the bare laterite hills which will remain for ever afterwards utterly sterile and useless."

The second point to which attention was drawn by Blane and Gibson was the destruction caused to forest land by the *Kumri* cultivation. This destruction was said to be then confined to the neighbourhood of the Ghâts, because it was there alone that any forests remained. It was carried on with such increasing activity every year as to bid fair to destroy the whole of the large virgin forests in a short time. Blane stated that the practice was so wasteful and improvident that it ought not to be tolerated excepting in a very wild unpeopled country, and he was of opinion that it should be placed under considerable check and regulation, if not entirely prohibited. The Collector said that the great difficulty experienced in exercising control over the forests in lower Canara and preventing destruction was due to the absence of all definition of the rights of private individuals. In the absence of such definition people asserted claims to private forest property which he was of opinion would prove to be without foundation. "There is nothing scarcely which the people of Canara will *not* claim as a right if they think there is any chance of it being conceded." He instanced the claim by private persons to the forests of the Coorg Mogamies. Before the days of the Company these were exclusively reserved by the rajah and were in many cases full of the finest teak timber. In the absence of all check by the Government, in the short space of twelve years, the greater part of these valuable forests had been cut out by timber merchants who had purchased the right to fell the timber from individuals who had no shadow of a right to sell. Blane recommended that if it was desired effectually to preserve what remained of the teak forests, the Government should distinctly assert their right to all such forests as could not be clearly shown to be private property. At the instance of the Government of Madras, the Government of India approved of these proposals. He was accordingly authorised to restrict the *Kumri* cultivation to such places and to such an extent as in his opinion might be expedient for the preservation of the forests and the general welfare of the Province, and to assert the right of Government to all forest lands to which a title could not be clearly established by private individuals. This seemed to be a great step in the right direction, but there was to be a serious retrogression in this policy in the future.

In the first years following the organisation of the Bombay Forest Department, no measures were taken to realise a revenue from the forests, except from the sale of the thinnings of the teak reserves, the object of Government being, in the words of Sir George Arthur, "to secure these general resources of the State, for the deficits of which no amount of revenues will compensate, and for the foundation of a system to be perfected hereafter which shall secure an adequate permanent supply of timber, future regularity being in no case risked for an excessive profit at the outset."

In the year 1848, however, Gibson proposed, by the levy of fees on the felling of jungle timber, to reimpose the seignorage which Government had been in the habit of receiving in the shape of a number of levies collected along with the transit duties, by the Land Customs Department, and which had inadvertently been abolished with these duties. These proposals were referred to the Revenue Commissioner and the various local officers for report. The plan was finally approved, though sanction was not received for its adoption until 1851.

In 1848 an Act (Act VI of 1848) was passed abolishing all export duty on the port to port trade of India, and removing the restriction which the Tariff of 1843 had imposed on the felling of young trees, the property of private parties. Thus the indiscriminate felling of young trees once again became possible at the very time when the Government were taking the first steps towards an effective conservancy of the forests. In May, 1848, the Madras Government, referring to the Act, asked for instructions as to the course to be followed to prevent the recrudescence of the trade in young teak trees. The Collector of Malabar, on his own initiative, had issued instructions prohibiting the exportation of teak timber of less than thirty-two inches in circumference. The Government of Madras, however, considering the measure to be open to serious objections, as a great part of the forest land in Malabar was private property, had directed the order to be cancelled; but as the subject was one of the greatest importance in reference to the future provision of timber a discretionary power was given to the Collectors of Malabar and Canara to adopt in all forests, of which the Government were owners or renters, whatever conservancy arrangements they thought best adapted to the circumstances for the preservation of the young trees. To this end the Government of India was solicited to pass an Act either to prohibit the export of undersized teak timber from

the ports of Malabar and Canara, except under the special authority of Government, or to modify Act VI of 1848 to such an extent as would empower the Collectors of these districts to levy a duty as before on undersized teak timber exported from these districts, leaving other timber and teak of larger girth free of all duty.

On receipt of this letter the Government of India called for a copy of all rules which were in force in the Madras and Bombay Presidencies and in Tenasserim for the conservancy of the forests. Madras replied that there were none save local rules drawn up by the Collectors of Malabar and Canara. Bombay said that their rules for the conservancy of the forests had not been definitely determined upon. In January, 1849, the Government of India asked for the Bombay Government's opinion on the Madras Government's letter on the subject of the prevention of the felling of young teak. Gibson was asked to express an opinion, and in his report stated that a legislative enactment interdicting the export of undersized teak timber would be of much service in Malabar and Canara. With reference to Bombay he stated that in parts the teak only grew to a small size and was cut and exported owing to the demand which existed. Such teak would never be serviceable for naval purposes. The trade in this small material should not be interfered with, but even here "it will be found necessary to fix the 'seignorage' on the smaller wood at a rate so high as to discourage the cutting of immature trees."

On May 26th, 1849, the Government of India replied to the letter of the Government of Madras, and their reply appears to show that so far they had learnt little from the experience of the past. After making allusion to the inconvenience that would arise from a partial repeal of Act VI, 1848, the letter states that His Honour in Council is unable to satisfy himself of the propriety of legislating even in this indirect manner, for the purposes of interfering with individuals in the management of their private property. . . .

"It does not appear in the first place that the Government forests, in which of course any conservancy arrangements that may be desirable can be introduced without a law, are not alone sufficient for public purposes. In the next place His Honour in Council finds it difficult to believe that proprietors of forests will be found, as a body, to pursue to an excessive degree the unwise and improvident course, the existence of which is assumed as sufficient proof of the necessity

for the interference of the law to restrain them in the management of their own property. A few such may possibly be found, but with regard to the majority, His Honour in Council cannot suppose but that they are likely to discern for themselves and to follow that course which is most conducive to their real interests, and that no such general and wholesale destruction of the forests will be found to take place as appears to be apprehended."

The enunciation of this opinion, in face of the correspondence before them, indubitably showing the devastation to which the forests had been subjected during the past half-century, exhibits a surprising lack of statesmanship and want of foresight. It also displays an ignorance of the customs and mode of outlook of the proprietors of woods, and of the necessities and requirements of the agricultural community who formed the bulk of the population for whose welfare His Honour in Council was responsible.

CHAPTER VIII

FOREST OPERATIONS IN TENASSERIM, BURMA, 1796-1840

THE history of the forests of Burma, so far as the British personally are concerned, commenced with the enquiries into their resources made by the Government on the acquisition of the Tenasserim Provinces, which were ceded to the British by the Burmese under the treaty of Yandaboo early in the year 1826. Although for some time previously trading in teak timber had been undertaken by the British in Moulmein (as also from Rangoon), it was from the date of this treaty that the resources and physical characteristics of the Province became the subject of interest and enquiry. Soon after the cession of the Provinces Captain Grant and Lieutenant de Montmorency were appointed to make a survey of the newly acquired territory. Captain Grant fell ill before any great progress had been made and the projected survey appears to have been abandoned; for although a map of a "Survey of the three Pagodas" prepared by Lieutenant Scotland is extant, which appears to indicate that he was appointed as a Survey Officer, no further papers have been traced regarding either of the projects.

In the following year, 1827, Dr. Wallich, the Superintendent of the Honourable Company's Botanical Gardens at Calcutta, was deputed to examine and report upon the botanical features of the Tenasserim Provinces, and while at Moulmein upon this mission he was desired by the Government of India (letter dated 1st March, 1827) to take advantage of the opportunity "to acquire the fullest and most complete information" of the resources of the country, in regard to both "botanical science and military and commercial objects"; as it was believed that the whole of the Tenasserim Provinces presented "a most favourable and abundant field for botanical researches, and that the productions of timber for military and other purposes were not only ample but of very superior quality."

The above early recognition of the great value of the resources of the Provinces furnishes admirable evidence, if evidence were required, of the acknowledged "flair" for the possible richness of newly acquired territories of which the Company's officials so often gave evidence.

In compliance with the order received, Wallich, whose name stands high in connection with the first researches into the botanical value, scientific and commercial, of the Tenasserim forests, left Moulmein on the 10th March, 1827, and proceeded on his tour of exploration. In his first expedition he ascended the Salween River for about 40 miles, and on his return he went up the Attaran River to a distance of 100 miles. His journals of these two excursions make delightful reading and present a vivid picture of the conditions of the country visited as existing a century ago. They also give evidence of the high administrative qualities possessed by the author and of a shrewd insight into the value of the resources of the new Province and of the dangers which would accrue if they were not protected from a ruthless exploitation by traders.

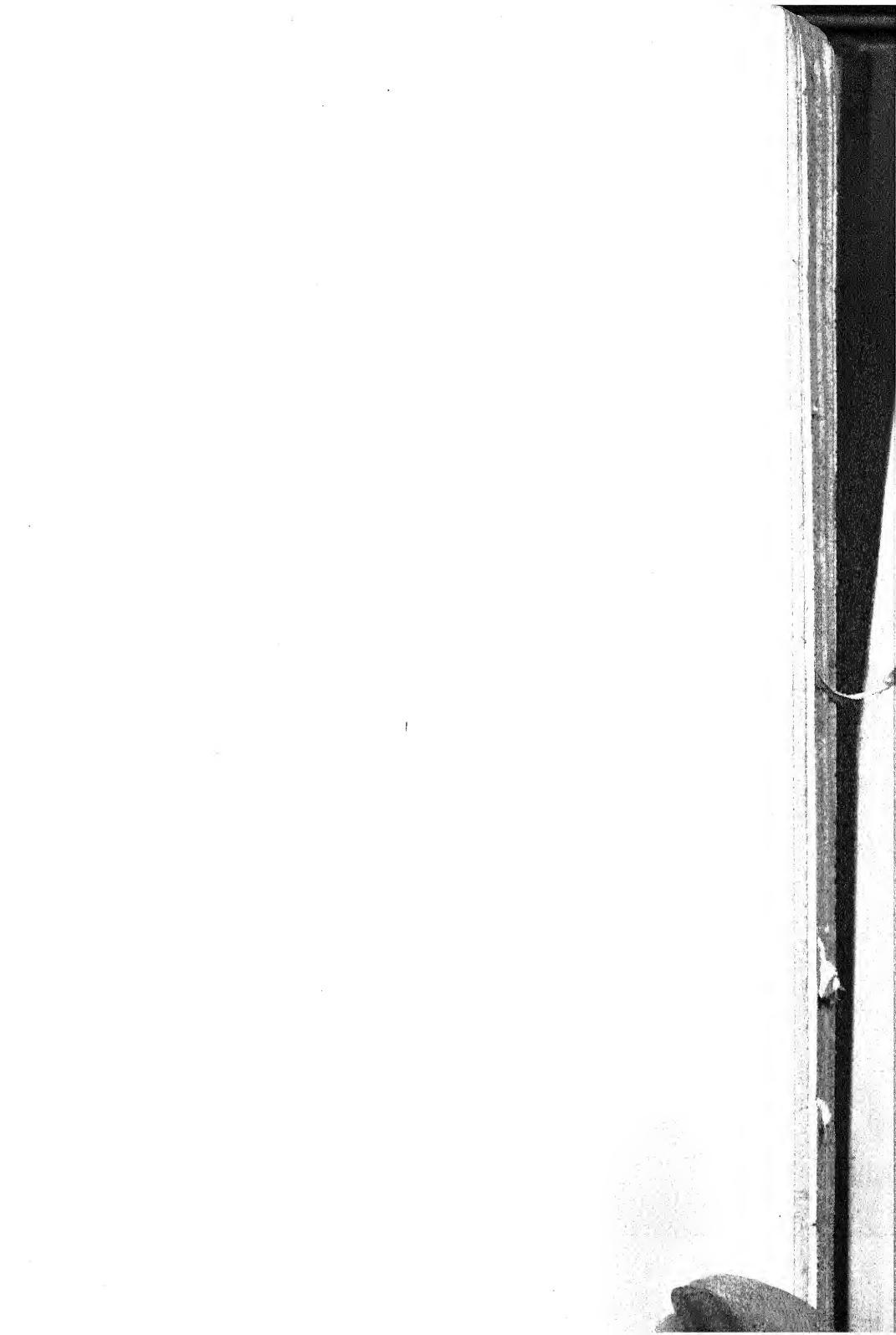
Up the Salween River. Leaving Moulmein on 10th March, 1827, Wallich crossed over to Martaban and entered the Salween River. This river, unlike the Attaran, becomes perfectly fresh within a few miles of its mouth. In consequence its banks soon lose the characteristic appearance presented by the mangrove forests of the brackish water and become covered "with high grass, erythrinas intermixed with betel palms and occasionally clumps of plantain trees." From its mouth the course of the river runs due north with frequent bends to east and west. Higher up the river the banks became steep and the hills were more or less covered with shrubs and trees. Wallich noted that at this time of the year the jungles were extensively burnt, and he "had no doubt that the ashes produced by the universal practice of burning the jungles during the dry season must have a very salutary effect on the soil as a species of manure." Several islands were noted on which cotton was grown, and the doctor recorded, "I do not recollect having ever seen finer cotton than what I procured here . . . Indeed, I think it exceeds even the Barbadoes cotton which I cultivated near Barrackpore and which in the opinion of the Court of Directors was superior to any on the London market. At Trugla, a village lower down the river, this cotton sells at Rs.30 (Madras) for 100 viss, equal to 365 pounds avoirdupois, if I rightly compute the viss," which was

considered to be wonderfully cheap. On the 13th March Wallich reached a small village called Phanoe on the right bank of the river in the neighbourhood of which there was a grove of sixty to seventy teak trees ; the best trees here had evidently been removed long ago. He notes "at this time of the year the tree is almost destitute of leaves" and therefore it is easily confounded with the *Nauclea*, another common timber tree, with a "sort of *Careya*," and several species of *Dillenia* and *Lagerstroemia*, all of which are like the teak deciduous and grow to forest trees of considerable dimensions. The average measurements of three trees measured here were 9 feet $\frac{3}{4}$ inches in girth (at 4 feet above ground) and 12 feet $5\frac{1}{2}$ inches of height to the first branch (his measurements were always taken at these points). The following day Wallich arrived at a village situated at the upper end of the island of Koa Theyu. "The village," he remarks, "is small and chiefly occupied in the cultivation of tobacco and cotton—two objects of agriculture which, together with sugar-cane, coffee and many others, would, I imagine, succeed extremely well on a large scale on this river." At the island of Koa-Lung they saw a float (raft) of 6000 bamboos of the small sort called Woa Tew, which had been brought from Miyang, where they cost Rs.10 per thousand, and were being taken to Moulmein, where the price was at the time Rs.3 per hundred. Wallich afterwards met with this bamboo in full flower, and he describes it as "a curious bamboo with the stem as thick as a moderate-sized arm, elegantly marked lengthways with irregularly white stripes like leaves of the striped grass." Four miles to the south-west at Miyang there was a teak forest estimated to contain two hundred good trees—those measured averaging in girth 9 feet $10\frac{1}{11}$ inches and height 19 feet $9\frac{7}{11}$ inches. The wood was dark-coloured and compact. Several of the trees had been felled, and writing of the felling of teak trees by the wood-cutters, Wallich observed, "Nothing could be worse than the miserable mode adopted here of felling the trees, in no instance below and generally above 3 feet from the base, and, if any obstruction occurred, which could easily be removed in many instances, even as high as $4\frac{1}{2}$ feet. . . . Few forests can be fairly said to be inexhaustible until they are placed under salutary laws ; and those of teak have been too long and too constantly laid under contribution not to require prompt and vigorous measures for their redemption. Among the produce of the land on which we may safely rely for

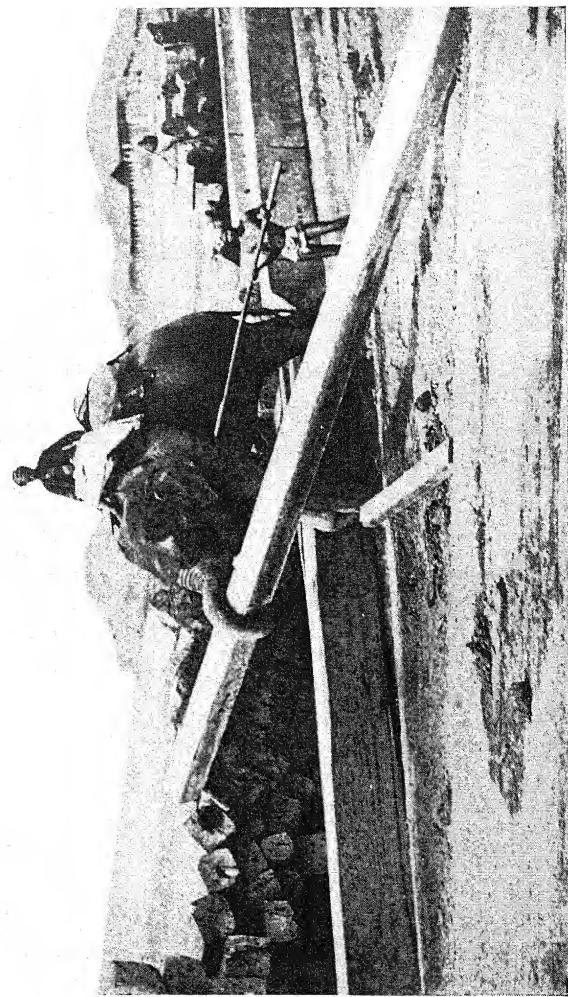
reimbursement of a great proportion of the expenses for the support of the provinces lately ceded to us, there can, I presume, be no doubt that the teak stands foremost. In my humble opinion not a single tree ought to be touched, not a stick of that valuable wood ought to be allowed to be carried away for any purpose whatever but those of the Government without their express sanction; and that to declare all such forests in our territories the property of the Company will be an indispensable step towards saving and, as far as it is practicable, reclaiming these forests." Had the wise policy here advocated been put into effect the revenues of the Province would have been enhanced in later years to a degree which is almost incalculable.

The third teak forest seen was on the right or Burmese bank of the river and almost 3 miles from the stream. It was intersected with nullahs, and contained some good trees averaging a girth of 7 feet 10 inches and height 25 feet 9 inches. The trees were considered to be easily extractable. He noticed here the Thengan (*Hoppea odorata*), which he considered next to the teak the finest timber tree in the Province. "It attains the most extraordinary size both in height and circumference, far beyond the dimensions which the teak ever acquires. The natives prefer it to the latter for boat-building, and I have a notion that it may be advantageously substituted on some occasions for other purposes. It is nearly allied to the saul of Hindustan (*Shorea robusta*), and like that abounds in resin or dammar."

Another teak forest also visited on the 16th March was on a high and precipitous bank, which was then gradually falling, on the British side of the river. This forest extended considerably inland. That part lying on the river-bank was estimated to contain 300 "capital teak trees," and the natives said the forest contained 2000 trees great and small. The average of trees measured was $7\frac{1}{2}$ feet girth and 26 feet 7 inches height. It was the best forest Wallich had seen, and he strongly advised that it should be placed under the care and management of Government Officers. He mentions that he saw the varnish tree, which he called *Melanorrhcea vernix* (*M. usitata*), of great size, though neither here nor at Martaban was the varnish extracted. He had witnessed the process at Prome where the tree was abundant. "Short joints of a small kind of bamboo, sharpened at one end like a pen, are thrust into holes cut into the bark in a slanting direction. In the course



ELEPHANTS PILING SQUARES OF TEAK TIMBER IN A TIMBER YARD AT RANGOON
From India Office Album



of twenty-four hours one-half or less is filled with the varnish, when it is removed ; 100 to 150 such bamboos are sometimes put into a tree at once." He also met with a beautifully flowering small tree which he named *Amherstia nobilis*. The forests at that time, he records, were infested by buffaloes, tigers and elephants. The villagers said they had no fear of tigers, as they seldom attacked anybody who did not enter the jungles alone ; and "as a reason for this abstemiousness on the part of the tiger, they said that the population was so small that the beast had not yet become acquainted with the taste of human flesh." Regarding the elephant, Wallich would assuredly have worded the following remark somewhat differently could he have foreseen the severity of the persecution to which this animal was to be subjected during the remainder of the century. "There can be no doubt that the productiveness of these parts in elephants might be rendered a source of great advantage, not only with reference to the Army, but in various other respects likewise, not to mention the value of the ivory as an article of commerce. It is a question whether it would not be practicable, without incurring any very great expense, to convey those animals in their youth to Bengal by sea, or to the still nearer south-eastern parts of our continental possessions. At any rate, it would be extremely desirable to establish a regular system of catching them either in Kyddahs or folds, as is done in some parts of Bengal, or in Obies, or pit-falls, which are used in Oude. Unless the number of these enormous consumers is reduced, it would be almost in vain to think of attempting any agricultural scheme of any extent. A sugar plantation would, under existing circumstances, have no chance of being reaped by the owner. Another consideration not to be altogether disregarded perhaps would be the probability of our falling in with some white elephants, a variety sometimes found in these forests."

It is not apparent to what Wallich was referring in his reference to the white elephants, although it is certain that in the eye of an Indian rajah such a specimen would be worth an enormous sum ; but his remarks anent the employment of the elephant for transport and other purposes foreshadowed the elephant "a-piling teak" at Rangoon, which was subsequently to become one of the wonder sights of the world. He also notices that "poultry" abounded in the jungles, where they were caught by the simple (poaching) contrivance "of

nooses attached to a string scarcely thicker than a pack thread."¹

On the 17th March Wallich returned to Moulmein, arriving there the following day. On the 23rd he submitted his journal to Sir Archibald Campbell, Political Agent in the Tenasserim Provinces, explaining that he was prevented by the lateness of the season from going beyond the Island of Koa-Ling. He added, "I have reason to believe that extensive teak forests occur further to the northward within our own territories, extending and probably improving as they recede from the Salween in an easterly direction. That the Province abounds in natural forests of that valuable wood, all the accounts I have been able to procure combine in asserting, and that the forests on the river just visited must at least at one time have been very productive may easily be proved from the vast quantity of timber which has been consumed in the construction of the Stockades at Martaban, and the numerous religious and other buildings existing both there and at many other places along the banks, which it is very unlikely have been supplied from any distant source."

Up the Attaran River. After submitting the journal of his tour up the Salween, Wallich again left Moulmein on the 25th March, 1827, and proceeded in the gun-boat H.M.S. *Berhamptooer* towards the mouth of the Attaran River. He had as companion this time Captain Montgomerie of the Madras Artillery.

The mouth of the Attaran is deep and wide, the general course being from south-east to north-west; the salt water continues for some distance up the river, the banks accordingly being densely clothed with mangrove with an abundance of rattans, the plant short near the edges and increasing behind, when beyond tide level, to the size of large trees. For three days they proceeded up the river, eventually reaching a deserted village called Assamee, two miles above which a small island, the first encountered, was perceived. Here the flood tide failed and the river became so shallow that the party quitted the gun-boat and continued the journey in small canoes brought with them for the purpose. Considerable difficulty was experienced in their progress up stream, the water frequently being insufficient, the canoes having to be pulled bodily over the sandbanks, whilst great trunks of trees lying

¹ The poaching devices of the natives of India are described in the author's *The Diary of a Sportsman-Naturalist in India*, p. 241.

right across the river bed were often encountered which had to be cut through before they could proceed. "I need not say," remarks Wallich, "that all these impediments cease during the monsoon, in which season the largest floats (rafts) may be conveyed down, and all sorts of boats carried far up the river and its branches."

Elephants, buffaloes, deer and other animals were numerous at that day in this part of the Province, for the journal states, "The marks of elephants became exceedingly numerous, especially ghauts or paths as accessible and cleared of jungle and rubbish as they could have been made by the hands of man, by which that sagacious animal is in the habit of going down to the river in order to drink or bathe, or to ford across it; it was therefore not unusual to see two such ghauts, the one directly opposite the other. The deep and fine sand on the banks generally conceals quantities of tortoise eggs, which our Burmese showed much dexterity in discovering by walking about and at each step pushing a small stick into the sand to a depth of one or two feet (the distance from the surface at which the cautious animal deposits its eggs). By means of this sort of probe they soon find out by the touch or sight whenever they have broken an egg, when they immediately set about digging down with their hands, until they come to the hidden treasure" . . . jungle fowls, peacocks, rhinoceros birds, divers, snake birds and kingfishers were very common.

On the morning of the 29th they reached a teak forest on the right bank of the river, the first Wallich had seen on the Attaran. It was little more than a grove containing forty excellent trees and some smaller ones. It had been worked shortly before his visit by the Civil Department of the Province, and he had an opportunity of examining and measuring the timber which had been taken from it. Half a dozen logs gave an average girth of $4\frac{1}{2}$ feet and length of about 30 feet. The Doctor visited another teak forest, higher up the river on the following day. This he described as "a fine forest consisting chiefly of teak trees and these of a superior description. Many of them were very large, and of these the plurality had been affected more or less at the base in consequence of the fires which had taken place here formerly." He noticed, however, that although the fire charred the outside of the tree and even the sap wood it did not injure the heart wood, the outer layers of the latter only being a little pale in colour. This forest was evidently of

some size and the average girth of twenty-seven measurements was nearly 10 feet. From here to Mittigate Creek, which was reached on April 1st, a constant succession of teak trees were seen on both sides of the river forming regular forests extending to the water's edge or receding back somewhat, the timber improving in size as they went up stream.

In the neighbourhood of the Mittigate Creek Wallich found a vast number of rattans and bamboos, both of the best description. Writing of the latter he says : " The bamboos were of the finest though not of the largest that I have ever seen and belong to the thorny very straight kind called Wonh-Kyah, 60 to 70 feet long, with a basal circumference of 15 inches and 10 inches at 54 feet, the thickness of the sides being 1 inch. We were told that a man could only cut and clean 30 stems per diem by the usual process employed by the natives, namely, by cutting them at 10 or more feet from the ground, instead of felling them at the base, which would require much more labour in consequence of the intricate manner in which the stiff and thorny branches embrace and entwine each other. At the above rate a man would be able to hew down 900 or, say, 800 in a month, ready for being floated down, in which state they would cost only 15 Madras rupees, supposing the labourer to receive 8 annas a day. I should think the transport to Moulmein of the number just quoted could not cost beyond 10 or at the utmost 15 Madras rupees, which would give a total of 30 Madras rupees. In Calcutta I have been in the habit of giving 25 to 30 sicca rupees per hundred of the best sort procurable there, which, however, is not to be compared to those I speak of ; so that even admitting that they were equally good the difference of price would amount to 800 %, a circumstance well worthy of serious consideration, because stems of a size adequate for commissariat purposes have for many years past not been procurable in Bengal, and constitute a great desideratum from hence."

Shortly before reaching the Mittigate Creek the party had to quit the canoes, owing to the shallowness of the water and obstructions in the river-bed. They marched through the country, and in the afternoon of 2nd April, after walking through a " narrow lengthened valley confined between two parallel ranges of small hills entirely covered with teak," they halted near the Kyoon-ben-Kyoung, or " Teak-tree-Nullah." This stream, about 36 yards wide, runs west-north-west, and

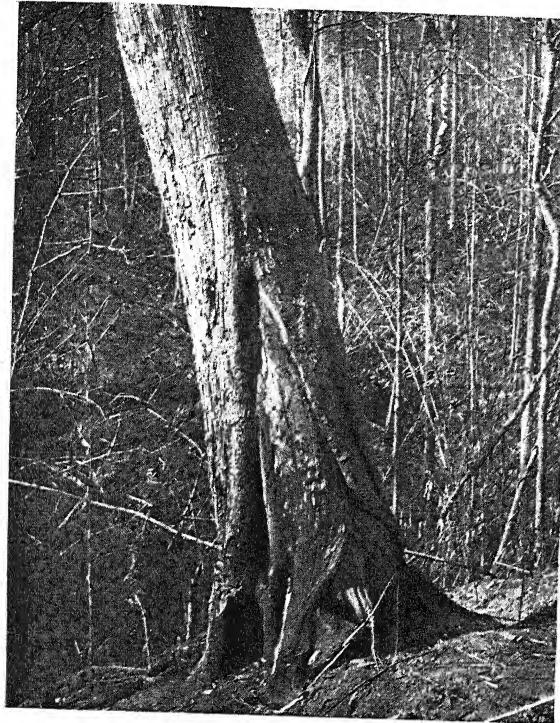
had still two feet of clear water in it in spite of the lateness of the season, the banks being fairly high. The teak forest here Wallich described as the most extensive he had yet seen. It extended five or six miles from the above-mentioned valley until it reached a stream which it followed for a considerable distance on both sides, disappearing towards a range of hills visible to the north. The ground was high and intersected with nullahs falling into the Kyoon-ben-Kyoung. The network formed by the streams and nullahs was, he said, quite adequate to float with ease all the timber which could be felled in this forest into the Attaran River. "Some thousands of teak trees, far exceeding the greatest size required for gun-carriages, might be hewn down here and conveyed to Moulmein with ease." As his examination of the forest was chiefly from the point of view of military requirements he did not carry out any particular investigation as to their capabilities for marine uses. "But we saw enough to warrant the assertion that the forest in question would yield plenty of very fine mast and keel-pieces, a fact evidenced from the different dimensions subjoined." The average of measurements taken gave a girth of 11 feet 4 inches with clean stems of 25 and 30 feet and sometimes of 50 and 60 feet. As evidence of the abundance of the trees Wallich said that on a line of less than 2 miles beyond the Kyoon-ben-Kyoung they "counted somewhat more than 250 excellent teak trees, including only those that were standing within forty yards of our path." This count would appear to have been the progenitor of Brandis' famous strip method, to be alluded to later, under which he computed the number and volume of the teak trees of the Pegu Forests.

According to Wallich the proximity of this fine forest to the frontiers of Siam, a country of which the inhabitants were much dreaded by the Burmese, would sufficiently account for its having remained almost untouched up to that day. Only a small number of trees had been felled and none recently. Innumerable bamboos grew in the vicinity of the forest, and could be employed in floating out the timber and subsequently used by the Military Department both in Burma and Bengal. The Doctor suggested that the teak trees after being felled could be drawn to the nullahs by elephants, and drew attention to the remarks he had already made in his Salween report anent their capture and employment. He thought that by employing here people used to catching them a sufficient number

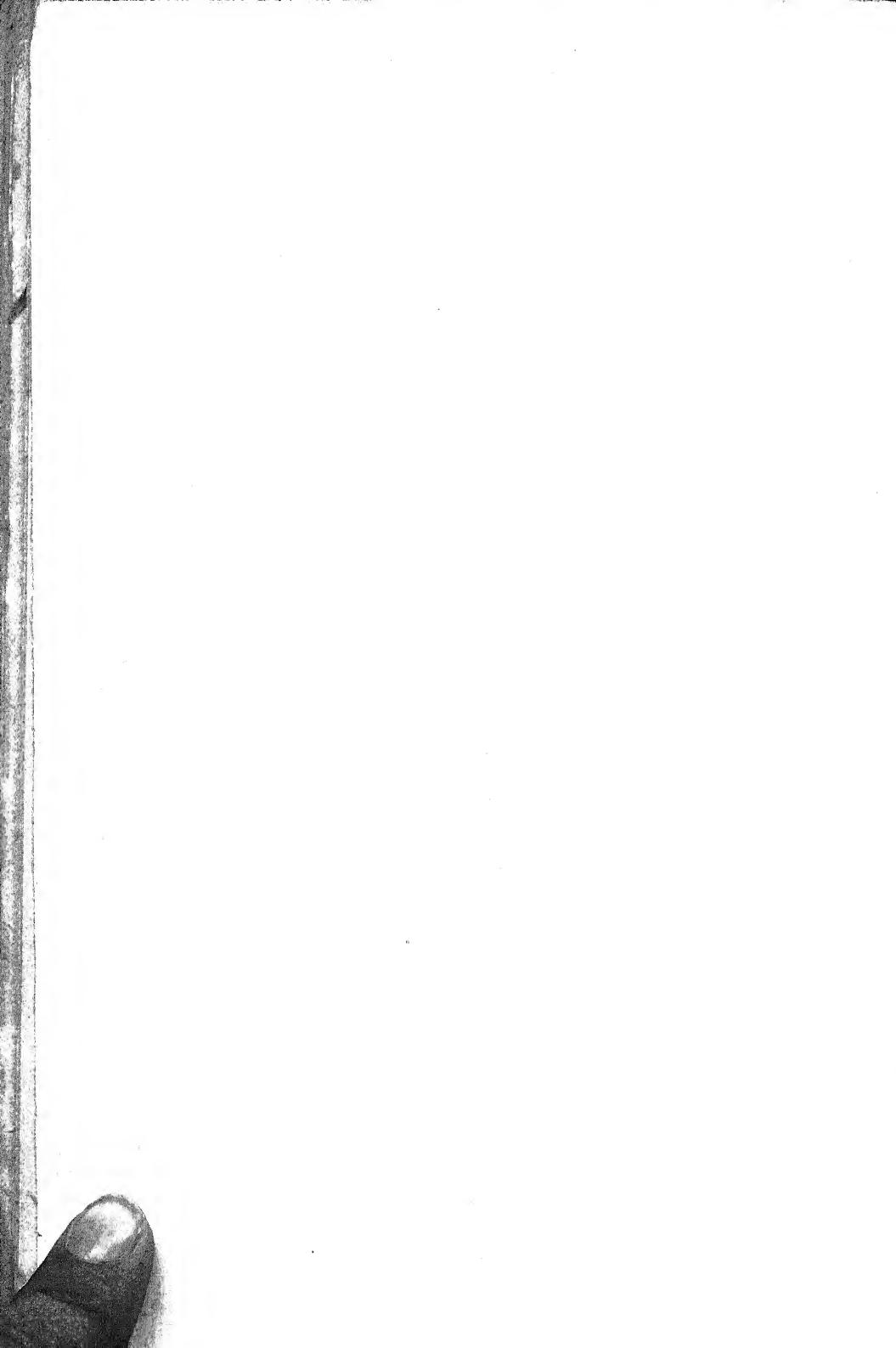
could be secured in one season for use in all the Government timber forests. Buffalo carts could also be employed here, the ground being unbroken. He again drew attention to the damage done to the base of the trees by the annual fires which swept over the country. When not badly burnt the damage done was not serious ; but successive fires gradually resulted in the holes found in the basal part of the tree and this portion often became hollow right through, with the inner surface converted into charcoal ; but scarcely an instance occurred where the remainder of the trunk was not perfectly sound. Wallich continues : " It is obvious that the prevention of this sort of mischief would be an object of great importance in the management of these forests ; but at the same time I am far from thinking that fires do any essential harm unless on occasions when, from the cause I have alluded to, a partial injury has already been sustained. I think that it would be impracticable to clear these forests from the gigantic under-wood which fills them, and which acquires renewed vigour and strength each monsoon, without the aid of fire, which, while it clears the ground from jungle, produces a beneficial manure. All that is required would be to remove from the vicinity of the trunks any dry piece of wood or the like, which might continue burning longer than the grass jungle generally does."

Forest Officers acquainted with the Burma Forests will realise that in the above remarks Wallich touched, with an almost intuitive foresight, on problems which were to influence the management of the forests of the Province throughout many long years, as will appear later on.

Near Kyoon-ben-Kyoung Wallich measured a wood-oil tree of great size : " its girth was 24 feet 6 inches at 2 feet and 21 feet 4 inches at 6 feet above ground ; its trunk 60 feet to the first branch and as straight as an arrow." There was no appearance of oil having been extracted from it or from any of the other trees of this sort which he passed. Although it was looked for the soondry (*sundri*), *Heritiera Fomes*, tree was not met with on the Attaran, although it was apparently common in these Provinces. That its qualities were well known at that time the following extract proves : " It (the soondry) grows to a great size in these parts, far surpassing any I have ever heard of in Bengal. On Beligeon the common girth at 5 feet above the base, where it throws off large buttresses, is 7 or 8 feet. In the estuary of the Irrawaddy called Panhang I got a trunk measured by my people which



DAMAGE DONE TO BASE OF A TEAK TREE BY FIRE. BURMA
A. Rodger in "Indian Forester," Vol. XXXIII.



had a girth of 12 feet 3 inches at the base and 6 feet at 6 feet above the ground. The disparity of dimensions would make one hesitate almost in considering the tree as the identical one of the delta of the Ganges and the Berhampooter, if they did not in all other respects appear extremely like each other. The wood, I doubt not, will be found equally good with the Bengal sort, which stands unrivalled for elasticity, hardness and durability ; and which, if it is not extensively employed for the construction of naves and felloes of gun-carriages, it is solely because pieces of adequate dimensions are not procurable there. The charcoal made from it is better than any other sort for the manufacture of gunpowder, and as a mere article of fuel it is excellent, and is universally employed in Bengal for burning bricks. The tree is called Kounyoo by the Burmese, and is much employed for posts in house-building."

The journal concludes with the following interesting remark on the country at that period. " Our return was rapid. . . . The Attaran is far more scantily peopled than the Salween ; but it is to be hoped that the settlement of the Taleyen Chief on that river with many of his people will soon reverse this state of things. At present there are but very few villages, the inhabitants of which occupy themselves principally with fishing and in cutting bamboos. We did not see a single cotton or indigo plant, so common on the Salween. After passing the old Attaran village we hardly met with a canoe, and during our march to the great teak forest we did not fall in with a single human being. In short, these beautiful, healthy and fertile tracts, together with most of the other parts of the Province, seem to have been entirely abandoned to Nature by that despotic and thoroughly bad Government from which we have wrested them ; and it requires not much sagacity to predict that, under the British sway, they will rapidly rise to that importance to which their wonderful natural capabilities so fully entitle them. In the last respect our ceded Provinces are second to no other part of the Honourable Company's possessions with which I am acquainted ; in point of timber forests they stand altogether unrivalled."

In this historical review of the forests of India it will be possible to show that Wallich's prophecy has been more than abundantly fulfilled under the just and wise rule inaugurated and carried through since he penned the above lines fourscore and ten years and more ago.

The party rejoined the gunboat *Berhampooter* on the evening

of the 6th, and arrived at Moulmein at sunset on April 8th. His journal was submitted to Government on 25th April, a copy being sent to Sir Archibald Campbell, whose attention was particularly directed to the value and importance of the teak timber resources of the Province and to the necessity of measures being adopted by the *Government* for their preservation and extension. Wallich had the prescience of genius, for his opinions and suggestions, had they been followed, would have saved the Tenasserim teak forests from the wholesale destructive exploitation to which they were to be subjected. He foresaw how the forests, unless especially protected by Government, would be exploited and exhausted. His letter to Sir Archibald contained suggestions on this head, which were not incorporated in the journal. In this letter, after stating that the forests contained extensive supplies of excellent teak, which, it was said, experience had shown, was better than either Malabar or Java teak for gun-carriages, and that the logs could be easily extracted by water carriage to the seaports, Wallich wrote the following paragraphs pregnant with the fate of these magnificent forests:—

"No forest exists which can with propriety be called inexhaustible—at least none that is liable to constant and extensive demands for timber. The quantity of teak used for public purposes, both military and naval, is so great, and it will go on increasing to so great an extent in proportion as new sources of supplies are opened, that the Martaban Forests, ample as they are, would be soon impoverished, unless they were placed under a vigilant and strict superintendence, their supplies regulated with economy, and their extent gradually augmented. I hope I take a correct view of the case if I consider all the teak forests which grow in these Provinces as the exclusive property of the State, applicable only to public use, and not to be interfered with by any private individual whatever. Unless this principle be acted upon from the very outset, I will venture to predict that private enterprise will very soon render fruitless all endeavours to perpetuate the supplies for the public service, and one of the principal and most certain sources of revenue will then be irretrievably lost. The most important step towards establishing a proper system for the management of the forests, and without which all others can be of no avail, will be a public declaration to the above effect strictly prohibiting all persons, not duly authorised, from cutting down any of the trees. But this done, the detail

of the further management may be accomplished with comparatively trifling expense, and with little trouble."

In the total absence of scientific forestry knowledge at home Wallich can be excused for the inaccuracy of the latter assertion. For the great Forest Department which has grown up in Burma is not a "trifling expense," nor are its duties carried on with "little trouble." But the trained scientific mind could foresee the great danger imperilling the forests. The Doctor was not an expert Forest Officer, and could not therefore be expected to possess the knowledge of sylviculture and forest organisation of the expert. Some of his recommendations, if carried out to the letter, would have forestalled the possibility of the forests by overcutting in order to provide as quickly as possible a larger supply of teak timber for Government purposes, and to make room for the young trees he wished to put upon the areas cut over. But, nevertheless, his recommendations, if they had been carried out, would have saved the forests from the deplorable devastation to which they were to be subjected by the mistaken policy introduced. The Government of the day received the advice and the warning, and, unfortunately, were guided by neither.

Wallich then made some recommendations with reference to the forests. All the mature and over-mature trees should be felled as soon as possible in order to obtain a large consignment of valuable timber for Government. All younger growths should be safeguarded, and all inferior species should be cut out so as to afford room to the younger teak trees for development and to allow light and room to permit of the germination of teak seedlings which, he said, would spring up in every direction. In these, later on, thinnings would require to be made. He continued :—

"I will go one step further, and recommend that the limits of the natural forests themselves should be extended, and that some of the high tracts of land, so well adapted for the growth of teak, which are to be met with in such abundance along the rivers, should be converted into plantations. It may at first sight perhaps appear premature to propose the adoption of an undertaking, the expediency of which is not supported by immediate urgency, and the ultimate benefit of which cannot be realised within half a century or more. To these two objections the answer is very simple. The first of them applies to many other public undertakings, which would prove the more beneficial for not being procrastinated until

the arrival of the unwelcome day of necessity. The second objection is applicable to plantations of all other sorts of timber trees, with this advantage in favour of plantations in India, that they are reared with less expense and trouble than those in Europe, and become in general available in half the time required by them. Millions of money would have been saved to Great Britain if, by early attending to the importance of reinforcing and enlarging the internal resources of timber, the necessity of foreign importation had been superseded. Surprising as it may be, the fact is not the less true, that our Indian forests of standard timber have within the last twenty years become very perceptibly deteriorated; the forests which were looked upon as holding forth the prospect of unceasing supplies have become exhausted, and even the vast saul forests of Hindustan have begun of late to fail."

The allusion above made to the position of Great Britain with reference to its timber supplies a century ago and the millions of money which might have been saved had an organised system of forest conservancy and planting been introduced into the country were applicable to the country, a hundred years later and might have been penned with reference to our position to-day, with the sole exception that for "millions of money," etc., we have to write "hundreds of millions, which might have been saved."

In submitting his journals to Government Wallich referred to the recommendations he had made in his letters to Sir A. Campbell, and strongly urged the importance of reserving the whole of the teak forests for the exclusive use of the State and of making a modified reservation in respect to some other trees such as thengan, soondry and bamboo; he also strongly advised the establishment at Moulmein of a Commissariat timber-yard of half-wrought materials, by which he believed a great saving would be effected not only in the charges for freight, but also in the expenditure of timber.

Wallich made another trip up the Attaran River with a view to procure a supply of teak timber for despatch to Calcutta, in order to enable the Government of India to decide on the expediency of having at Moulmein an establishment such as he had recommended. He took with him an artillery sergeant and six pioneers to do the felling work. The party started on the 10th May. A month had, however, elapsed since his previous trip, the monsoon rains had broken and in place of the shallow water and numerous obstacles the party now

encountered a strong current. Owing to the high level of the water the appearance of the scenery on the banks had completely changed. Trees previously leafless, such as the Jarrul, Cuddum and Semul (*Lagerstroemia*, *Nauclea* and *Bombax*), were now in full leaf, and everything pointed to the arrival of the monsoon. He did not get higher than twelve miles above the Assamee village, and after the tents of the party had been flooded out by the rapid rise of the river he resolved to return to Moulmein without effecting the object of the expedition. On his way back he landed the party near the former village of Attaran, where there were a few teak trees, and had one measuring 17 feet 3 inches in length and 14 feet 9 inches in girth cut down and by this means obtained nearly 300 cubic feet of most excellent wood, "exceedingly fine, of a dark colour and strong scent." The work was done by the pioneers, whom Wallich considered to be better and less expensive than Burmese, who "will not work for less than 12 annas a day, be it wood-cutters, boatmen or common labourers, and besides they would perform only half the quantum of work which the pioneers would get through in the same given time." This expression of opinion indicates that the British made early acquaintance with the Burmese disinclination to work. Several other trees here were girdled for future removal.

It was unfortunate in many ways that this expedition started so late in the season and failed in its object. For the future treatment of the teak forests might, it is possible, have been widely different had Wallich procured the supply he intended and returned himself to Calcutta with it.

In their letter dated 6th July, 1827, the Government of India acknowledged the services of Wallich to have been "highly satisfactory, as well with regard to the resources to be drawn from our new territories, as to the additions which have been made to botanical science." In accordance with his suggestions instructions were issued in a letter of same date to Mr. Maingy, who had meanwhile been appointed Civil Commissioner of the Tenasserim Provinces, to hold the forests as Government property, and to protect them from depredation or injury by individuals.

So far the position was clear cut, and had full effect been given to the proposals contained in Wallich's journals, acknowledged so favourably by the Government of India, an estate of incalculable value would have been preserved to the

Government to be utilised in the development of the country, and in the interests of the people. Maingy, to whom this great charge had fallen, proved himself a narrow-minded and short-sighted man, quite incapable of realising the magnificent possibilities which lay before this great untapped source of wealth which had been acquired with the new Province. He looms across the scene as a sinister figure with fixed ideas and narrow views on the forests and resources of the country. For the policy he advocated and introduced was to remain in force through several decades thereafter.

In reply to the Government of India's letter he solicited for his guidance more particular instructions as to the management and working of the forests, and remarked with reference to Wallich's reports that from enquiries he had made, and from personal observation, he was of opinion that the forests were by no means so extensive as to be considered inexhaustible, that the plan of extending them would be difficult in a country overrun with elephants, and that instead of incurring the expense of establishment for preserving them for the sole use of Government, the most advisable course would be to "issue licences to private individuals to cut timber on condition of paying to Government a duty of 10 or 15 per cent upon the value of the timber when brought down for exportation ; the value to be fixed by arbitration ; it being always optional with Government to take any portion of the timber at such valuation." Maingy also thought "a general and equal duty of a certain sum upon each tree cut would be a good mode of preventing the smaller and less valuable trees from being cut down" ; and that "a regulation also confiscating all timbers cut under specified dimensions would tend to preserve the young trees."

In this fashion the licence system originated in the teak forests of Burma—a system which, whilst ruining large areas of forest, yielded to the Government Treasury but a fraction of the value of a property which was unquestionably theirs ; whilst the national interests of the people suffered in the long run a serious set-back from the drain of one of the valuable resources of the country, the greater part of the profits from which went into the pockets of a comparatively small number of private individuals who exploited the forests to their own benefit. It is true that the rapid opening out of these forests resulted in a temporary prosperity by affording a considerable amount of work, but this sudden development was to the

interests of neither Government nor people since it resulted in the depreciation for a long period of a valuable estate. Nothing was done on the subject of Maingy's letter, the Government saying they would await the receipt of further information. The forests were meanwhile worked by Government as a monopoly, and large supplies of timber were cut ready for an expected indent from the Military Department. Some of this timber was shipped as an experiment to the Calcutta market, 511 logs, valued at Rs.6000, being despatched in May, 1828, from Tavoy. Shortly after its arrival it was sold by public auction at a loss of Rs.250. This unfavourable result put a stop to further shipments of timber for that market.

It is quite evident from the correspondence that the timber merchant of a century ago followed very similar methods to those of some of his present-day representatives. It would have been interesting to have had a record of the purchaser or purchasers of this timber. It was scarcely likely that the Calcutta timber merchants with their vested interests elsewhere would welcome the new competition under Government ægis from Tenasserim; and it may be readily surmised that theirs was the hand which hoodwinked the Government as to the value of the Tenasserim teak. But it was a bad set-back. A year later Maingy again suggested to Government that the trade in timber should be thrown open and private individuals be allowed to proceed into the forests and fell trees of any description under the following rules:—

Rules of 1829. 1st. All persons applying to fell timber are directed to point out where they intend employing themselves for that purpose, together with the number of men in their service.

2nd. No timber shall be removed from the banks of any river without the sanction of the Commissioner, his deputy or assistant, having been previously obtained.

3rd. All timber shall be subjected to a duty of 15 per cent, to be levied in kind or money at the option of the Commissioner, his deputy or assistant. The timber to be valued by two arbitrators, the one to be selected by the Commissioner, his deputy or assistant, the other to be chosen by the owner of the timber; in the event of a difference of opinion between the arbitrators the Commissioner, his deputy or assistant, shall be at liberty to appoint a third.

4th. It shall be at the option of the Commissioner, his deputy or assistant, to select for the use of Government any

portion of the teak timber felled in this Province, the value of such timber to be settled by two arbitrators as above stated.

5th. No teak trees shall be felled the girth of which shall not exceed 4 feet, and all such trees felled within that girth will be confiscated by the Commissioner, his deputy or assistant.

With an adequate supervising staff these rules might have been effective and a check to ruthless exploitation. When the size of the country is taken into account, the absence of a trained staff and the ignorance appertaining to the forests themselves, which were unsurveyed, the above rules were counsels of perfection quite unrealisable.

Unfortunately the disappointment resulting from the sale of the Tenasserim teak in Calcutta induced the Government (letter of 1st May, 1829) to accept Maingy's repeated suggestions to throw open the forests to private individuals on the terms of the above rules, or with such modifications of them as he might deem it expedient to make.

The rules were accordingly put in force, and several speculators (the word is used in the correspondence), both European and native, appear to have taken out *lekmais* or licences to fell timber in particular localities in the forests.

No records of any material importance appear in the correspondence during the next two years, i.e. to August, 1831.

In the latter month Maingy, having become convinced that timber of larger size and superior quality to that usually imported into Calcutta from Rangoon could be sent from Moulmein and delivered in Calcutta at a lower cost, submitted to Government a tabular statement in support of his views. The statement was referred to the Marine and Military Boards, but there are no records that they took action upon it.

It is not to be supposed that Wallich looked on in silence at the introduction of the licence system into the teak forests, which was so directly contrary to his recommendations.

The correspondence extant does not exhibit any formal letters of remonstrance at the adoption of Maingy's policy, and the former may well have been deeply chagrined at the loss incurred by the sale of the first consignment of teak logs from Moulmein. Whilst in England on furlough, in 1831, Wallich was questioned by the Navy Board regarding the production of timber in the newly acquired Burmese Provinces. At this period the Admiralty were becoming seriously concerned over the deficiency at home in supplies of oak timber, and of teak in Malabar, for shipbuilding requirements, and were

naturally interested in any new outlet which gave promise of large supplies of good teak timber. The Doctor submitted a copy of his journals to the Navy Board accompanied by a letter, from which the following extracts are of high interest :—

" The province of Martaban abounds, more than any part of India I have ever visited, in a luxuriant profusion of the noblest vegetable productions ; the number and variety of fine timber trees produced there is, I believe, quite unparalleled. But in regard to the teak, such is the quality of it, such the beauty of the climate where it grows, such the numerous advantages which present themselves there, of proximity to the main British possessions, etc., that I venture to offer it as my firm conviction that the Provinces might and ought to be made to furnish the British Navy with a permanent supply of the very best timber in the world. To this end I would suggest that plantations of teak should be established on an adequately extensive scale, which, it requires very little foresight to predict, would within a comparatively very moderate lapse of years become productive of almost incalculable benefit. . . ."

" The next to which I shall advert is the Thingan (*Hopea odorata*), the most gigantic timber tree in India, reckoned by the Burmese as little inferior to teak in quality, and far exceeding it in point of dimensions. It grows in vast abundance near the seashore, where it constitutes one of the principal features of the forests. It is used chiefly in the construction of canoes, the largest of which are often formed of one single excavated trunk. There are several other trees of the identical class with the Thingan, which attain a great size and afford a valuable timber. They all abound more or less in a beautiful and clear resin, which is easily extracted, and is superior in quality to the dammar or resin obtained from the saul of Hindustan.

" It may perhaps not be deemed improper to mention in this place two substances which are produced in vast quantities in the Burmese territories, and which in my humble opinion deserve being brought into extensive use for marine purposes. One of these substances is the wood-oil, derived from an immense forest tree of the same tribe with those just mentioned, and found everywhere on the Tenasserim coast ; the other is the petroleum, or earth oil of the banks of the Irrawaddy. The former is an excellent and cheap substitute for linseed oil, possessing moreover superior preservative properties ; the latter I know to be an infallible remedy against the attacks

of insects, especially the white ant, and I believe it would effectually resist the dry-rot."

These last are sufficiently humble recommendations in favour of a product which was to become the prime motor power of the world !

But the letter affords fresh evidence of Wallich's great powers of observation and the value of making use of the scientifically trained, as against the purely officially trained, mind in matters of this nature. The one observes closely first, and bases his deductions on the observations so made. The other, without the power of observation developed by the scientific training, bases his deductions on inferences and often heresay evidence, which in cases of this kind lead to wrong conclusions. Herein lay the chief reason for the difference between the policies of Wallich and Maingy at this critical period in the history of the Tenasserim teak forests.

A copy of Wallich's letter was sent by the Admiralty to the Government of India and forwarded to Mr. Blundell, who was acting for Maingy at the time. Blundell forwarded to the Doctor a specimen of each kind of timber with details of the extent to which it was procurable and the ways in which it was used by the natives. No report appears to have been made on these specimens.

In July, 1833, Maingy was authorised to entertain a small forest staff of "one head man and eight to ten coolies" for the purpose of planting and rearing teak seedlings, and to see that the wood-cutters who were employed in the forests by the holders of the *lehmats* or licences felled the teak fairly and did no damage to the forests. This is described as a "first step towards the conservation of the forests," but the idea that a staff of this size in a country of such dimensions, where travelling was so slow and arduous, could undertake any work of importance or that it would be above the common practice of accepting bribes is little short of amazing.

Maingy's next step was a letter to the Government dealing with the operation of the rules of 1829. He stated that the throwing open of the forests to the public under those rules had encouraged speculators to explore the country, and by that means its value and resources were being developed daily. He added : "During the last three years no less than 7309 tons of converted teak timber have been exported and three square-rigged vessels have been constructed, and four more, two of them ships of 300 tons burthen, are now on the stocks." It

would have been of interest to have had some figures on the subject of the deplorable waste in conversion, then so prevalent, and of the damage done to young growth in felling and conversion of the old trees, and of the proportion of the latter, if any, left on the ground to serve as seed bearers to reclothe the areas felled over ; but the report is silent on these matters, and inspection in later years show that these fellings practically ruined the forests in which they were made. He continues : " The teak forests are found to be very extensive, not only along the upper part of the Attaran River, but on the eastern side of the Salween, and I see no chance of their being exhausted. Our wood-cutters would be much encouraged if an import duty were charged at Calcutta, as at Madras, on teak, the produce of the kingdom of Ava, and perhaps the *ad valorem* duty of 15 per cent might be beneficially remitted for a few years on all timber for shipbuilding " !

The following year, nothing having been meanwhile done, Blundell, who had succeeded Maingy as Commissioner, suggested as an alternative proposal that the duty generally should be reduced to 10 per cent on all timber.

The Governor-General in Council in a resolution in the Customs Department, 5th January, 1835, commenting on this suggestion, said : " Saul timber, the produce of the Bengal Presidency, is subject to a transit duty of 10 per cent, Sissoo to a duty of $7\frac{1}{2}$ per cent, but teak timber wheresoever obtained or bought pays no duty in Bengal. The reason of the difference was to encourage the import of teak as a valuable article of shipbuilding. The tariff has continued at these rates since its enactment in 1810. The greater part of the teak imported came from the Burmese Empire, there being no teak forests in Bengal. The Tenasserim Provinces were acquired in 1825, and since that date the requirements of teak have been so extensive as to bring about a fall of price of this commodity in Calcutta to nearly an equality with saul. The imports from Rangoon have continued, but the article from thence has been undersold by the teak timber from Moulmein."

The Commissioner now asked, said the Governor-General, that the duty on teak from Moulmein should be lowered, and further that the Moulmein timber should be favoured in the Calcutta market by the imposition of a duty, as at Madras, on teak from Rangoon.

The duty, the Resolution continued, levied on the Moulmein timber should be regarded in the nature of a rent, and the

thriving conditions of the trade in itself showed that this rent was not excessive, "and until the forests should become exhausted" (it is apparent that that contingency was faced with equanimity even by the Governor-General in Council), "or from the necessity of going further afield to find the timber" the duty should be left as at present. Even a higher rate might be advisable to preserve the forests from waste, but it was justly pointed out there was no particular reason why the shipbuilding establishments of Moulmein should be favoured by an exemption of the rent, seeing that the nearness of the forests and the security to property (brought about by British rule) already gave Moulmein sufficient advantages over Rangoon.

In March, 1837, Blundell made a further attempt to favour Moulmein teak (on the advice, one would imagine, of powerful commercial interests), and recommended the levy of a customs duty at Moulmein on teak timber imported there from Rangoon and other places within the Burmese territory, as otherwise the "foreign timber," as he termed it, being imported free of duty, would undersell that cut in the Provinces and subject to the 15 per cent duty. Lord Auckland, however, as Governor of Bengal, declined to authorise the measure, without further information on the subject of the places from which all foreign timber was sent, and again reminded Blundell that the 15 per cent duty was in the nature of a rent for the privilege of cutting teak in the forests.

In the following month a correspondence took place between the Commissioner and the Government on the subject of the conservation of the forests. Blundell pointed out that as an unforeseen outcome of the introduction of the licence system in 1829 chaos now reigned in the forests. Under the system parties who desired to cut timber were granted "permits" or licences for certain localities. These permits excluded all other cutters from the localities for which they were granted; the permit was revocable at pleasure of the authorities, and though the transfer of forests had been allowed, yet such transfer had never been recognised as conveying aught but the permission to cut timber in certain localities. At first matters ran smoothly. The timber was all near the banks of the river, and the market was in its infancy. With the increase in the numbers of speculators and the larger amounts of timber felled, the cutters had to work inland from the river-bank. Great confusion soon arose since no defined boundaries of the

individual forests, in the absence of all survey, were laid down on the ground, "licence" holders encroached on each others' assumed boundaries, leading to disputes and suits in the Courts which Blundell stated "we have not the means of deciding with any satisfaction to ourselves or to the litigant parties." He added, and no greater acknowledgment could have been made, within so short a time after they were penned, to the recommendations made by Wallich in his journals, "the distance of the forests from the towns, their great extent, and the want of an efficient Conservator invested with adequate powers to notice and decide on the spot all infringement of the rules framed, both for insuring proper timber being cut and the preservation of the young trees, must lead, I fear, ere long, both to bring the Moulmein timber into bad repute and to exhaust the forests, without providing for their renewal in after years." To remedy these evils he suggested "the appointment of some individual well acquainted with the state of the timber market in India and England, as at least a temporary Conservator of the forests, with full powers to decide on the spot all cases of infringement of the rules and all suits relative to boundaries. This person should also be directed to draw up a report on the state of the forests, and above all, on the eligibility of resuming the permits to cut and reconstituting a monopoly." Blundell was of opinion that these measures would safeguard the forests whilst enabling Government to send supplies of timber to His Majesty's building yards in England. At the same time he very fairly pointed out that one of the proposed measures involved "the interference with apparent private rights accompanying the original permits to cut timber sanctioned by eight years' adherence to the present system and would lead to expense, which, in justice, must be incurred in compensating the holders of the original permits for their outlay towards facilitating their operations in the forests." In other words, the Government had allowed a monopoly of private timber merchants to grow up in this short interval. A monopoly which in a modified form spread throughout other of the forests of Lower Burma; and which, as will be shown, the most strenuous efforts backed by the most influential support both in India and at home were made to extend it to the forests of Upper Burma after its annexation at a much later date.

If this monopoly, said Blundell, in the face of the expense to be incurred, was not to be resumed, it would still be absolutely

necessary to have a survey of the forests in order to define the boundaries and to appoint a Conservator to preserve the forests and provide for their renewal.

It will be remembered that efforts were being made in Madras at this time to have the Conservatorship, abolished in 1823, resumed in that Province. The Commissioner of Tenasserim was probably acquainted with the steps thus advocated in Malabar. He recommended the appointment of a Conservator on Rs.500 per mensem, one native assistant (who already existed) on Rs.40 and six peous, (to act also as boatmen) on Rs.10 each—a total amount of Rs.600. The Conservator was to be a gentleman already in the service of the Company who would be strictly interdicted from engaging in trade. He further suggested the employment of convict labour in the formation of nurseries. These suggestions were a complete *volte face* on the part of the Commissioner, forced upon him by the consequences which the 1829 licence system had brought about.

No reply having been received to this letter, Blundell again wrote in March, 1838, on the subject of the appointment of a Conservator, representing that the necessity had become greater “inasmuch as every season the forests became more exhausted without adequate measures being adopted to prevent waste and to ensure their renewal in after years.” No adequate forest rules could be framed or enforced unless such an appointment was made. To meet the charge for the enlistment of the forest staff he now recommended that the *ad valorem* duty on timber should be raised from 15 to 20 per cent, which would not be detrimental to the timber trade, as the duty was levied either in money or in kind, at a valuation below market rates.

The whole correspondence was submitted in April, 1838, by the Government of Bengal to the Governor-General, Lord Auckland, with the remark of the Deputy Governor, Mr. Ross, that he “very much doubts whether the present great extent of the teak forests would admit of the property in the timber being guarded and preserved, without arrangements calculated to be very vexatious, or without establishments of a very expensive kind, which the duty levied on the wood-cutters would scarcely repay.”

Lord Auckland, considering that he had insufficient information on the subject of the necessity for creating a Conservatorship, called for information from Madras relative to the two great teak districts on the western coast of that Presidency,

one of which had been managed by a Conservator, while the other "was without such minute superintendence." He also called for a detailed report from the Commissioner of the Tenasserim Provinces relative to the whole previous working of the forests, the method of forming young plantations, the possible income to be expected and the effect on the general prosperity of the State resulting from the trade, and upon the powers to be delegated to the Conservator. On the latter point "he was doubtful whether it would be necessary or proper to give to such officer such full and independent magisterial powers for the conservation of the forests as was suggested," and he thought that an uncovenanted officer who had gained character in the Department of Works and Survey should be appointed to the post of Conservator if created, and that the post should be rather temporary, of the nature of a "Reporting Officer" merely, than permanent, and that his work should be confined to obtaining full details on the present state and management of the forests. Lord Auckland concluded his Minute "that he would on no account add to the present duty on timber, nor is he inclined to reserve the cutting of the trees as a monopoly in the hands of the Government."

The information solicited from the Government of Madras was obtained, and Blundell intimated in August, 1838, with reference to the orders he had received (as detailed above), his intention of first visiting the forests in order to report on the several questions raised by the Governor-General.

Nearly two years elapsed without any references to the teak forests appearing in the papers extant. A veil is drawn over Blundell's activities in this connection. All that is apparent is that the heavy fellings in the teak forests continued unchecked and that their condition went from bad to worse.

The next record refers to Madras. To the Despatch, which has been already mentioned in a previous chapter, dated 26th July, 1840, from the Court of Directors, directing the attention of the Government of India to certain measures which had been proposed for the preservation of the teak forests of Malabar. In April, 1840, the Government of India, in accordance with this Despatch, called upon the Governments of Madras and Bombay for information respecting these forests, receiving in reply the voluminous correspondence which has been already reviewed.

Before passing to the subsequent action taken it will be necessary to glance at Dr. J. W. Helfer's reports. As far

back as the end of 1836 Lord Auckland, in a Minute dated 26th December, 1836, suggested to the Government of Bengal that the deputation of Dr. Helfer enquire into the material and commercial capabilities of the Tenasserim Province "in order that the Government and the public may be enabled to judge with what advantages of circumstance, and consequently with which prospect of success, commercial speculations and the employment of capital may be directed towards them." The results of Dr. Helfer's researches were submitted by him to Government in three reports which were presented in 1838-39.

After treating of the distribution of the teak and the destructive habits of the natives "who ring and kill trees of all sizes, many of which are never felled and utilised," Dr. Helfer mentions in this connection: "This number of killed trees which are suffered to decay generate a host of insects. Though it is pretended that teak is not attacked by vermin, yet a great deal of these decayed trees are attacked by *Bostri-chus*, *Passalus* and other coleopterous insects,¹ and the consequence is that these animals have attacked other good trees before they were sufficiently seasoned. He also alludes to the firing of the forests and the *toungya* (shifting) cultivation under which so much valuable teak forest was being destroyed. "As teak is such a valuable article in general," he remarks, "and, it may be safely asserted, hitherto the only one to which Moulmein owes its daily increasing prosperity, the preservation of teak forests should be the principal care of Government." He strongly advocated the formation of plantations since, even with good management, the number of trees must yearly decrease, and that timber in localities of easy access must soon become rare. Experience has shown, he said, that new trees disseminated by nature on places where timber has been hewn grow only very scantily up. Helfer's remarks on the subject of natural regeneration in the teak forests, as also his suggestion that the new plantations could be formed by clearing the jungle, loosening the soil, and then scattering the seed over it, were opinions held at the time, but were disproved by Mr. Conolly's experiments and failures at Nilumbur.

In his second report he points out that although the licence system introduced in 1829 "without doubt in the first instance

¹ The writer found the following upon teak on the Salween and Attaran Rivers and elsewhere in Burma: Species of the genera *Basilianus*, *Adelocera*, *Stromatium*, *Gelonaetha*, *Xylotrechus*, *Cryptorhynchus*, *Xyleborus*, etc.

contributed to render Moulmein a prosperous place, it cannot be denied that a continuation of the same system will lead in a short time to the extermination of all available teak forests, and deprive Moulmein of this valuable resource, and render Calcutta even more dependent upon foreign importation for teak timber." He pointed out that the private individuals cutting in the forests and naturally wishing to render themselves independent in as short a space as possible, had no interest in the preservation of the forests, and that experience had shown that far more trees were destroyed under the present system than were actually utilised. He therefore recommended the adoption of Blundell's recommendations for the future conservation of the forests.

Describing the Tenasserim Provinces (which he quoted as 30,000 square miles in area) as one immense forest with no marshes, sandy plains or bare rocks or savannahs, he assumed that only one-fifteenth part was cultivated ; another one-fifteenth was occupied by rivers, and two-fifteenths as the area burnt over and which was now only clothed with a useless rank jungle vegetation ; this left 22,000 square miles occupied by the forests. " Supposing that trees (measuring at least 7 inches in diameter) stand 30 feet apart from each other on an average in a forest and that each tree occupies 900 square feet or 100 square yards " ; this would give, he calculated, 29,040 trees in one square mile, or 638,880,000 timber trees in the Provinces. Helfer continues this ingenious, but not uninteresting, calculation : " Each tree counted on an average at 2 annas intrinsic value on the spot, there is at present a dead capital of 79,860,000 rupees in the timber alone. . . . Though one-half of it is so situated that centuries will elapse before it will be turned to any use, yet the other half is so placed that it is available. The whole of the country on an average is not more than 50 miles broad, has a sea-coast, accessible in all parts, of 414 miles in length ; the land is intersected in all directions by numerous rivers ; the tide ascends in some parts 120 miles up country. . . . Much of this timber is entirely neglected. I have now already gathered a catalogue of 377 different species of trees, each of which attains a diameter of 7 inches, and amongst them are species of every imaginable purpose."

Helfer divided the trees in general into eight groups : (1) Precious trees ; (2) woods fit for objects of ornament ; (3) timber for shipbuilding ; (4) timber for other purposes ;

(5) spars for vessels ; (6) chiefly fitted for planks ; (7) produce good charcoal ; (8) firewood.

Wallich and Helfer were remarkable men for their day to find at this period in India. The misfortune for the country resided in the fact that, a scientific training being unknown in the schools at home, the bulk of the officials, even those most highly placed, were unable to appreciate the deductions and warnings placed so plainly before them.

In 1840 Captain E. P. Halsted, R.N., of H.M.S. *Childers*, then cruising off the west coast of the Bay of Bengal, became greatly interested in the facilities afforded by Moulmein, with its plentiful supply of timber, for the construction of ships, and he formed the opinion that its advantages in that respect "were not surpassed, if equalled, by any spot in India," but "were not so well known as they should be for general usefulness." Captain Halsted collected some interesting information on the subject of the Tenasserim teak forests and the destructive exploitation taking place in them, which he submitted to Lord Auckland in August, 1840. In the following November he again addressed Lord Auckland on the subject of the comparative strength of some Tenasserim pine which he had obtained from Moulmein and which he had submitted to a series of detailed tests with some Riga pine on the *Childers*.

The Moulmein pine gave such excellent results that he recommended its being utilised for spars for men-of-war, thus saving the expense then incurred of having the latter sent out from England.

CHAPTER IX

FOREST OPERATIONS IN TENASSERIM, BURMA (*continued*)
1840-1850

THE reports of Helfer and Captain Halsted, alluded to in the last chapter, both strongly animadverting upon the ruinous devastation taking place in the teak forests, convinced Government of the necessity of introducing an efficient system of conservancy, though the evil at that time did not seem to justify the resumption of the "permits," or a reconstitution of the former monopoly, as had been recommended by Blundell. With this view it was determined, instead of a separate Conservator, to appoint to the Department of Public Works in the Tenasserim Province an executive officer who, in addition to the duties of that Department, should have the charge of the Government teak forests. A moderate establishment was to be allowed him for their preservation, and for regulating the cutting of timber in those forests where the Government could, without injustice, interfere with the grantees; and he was also to act as Agent for providing timber for Government shipping purposes at Moulmein. Captain Tremenheere, of the Bengal Engineers, was the officer selected to hold this threefold appointment, and to undertake a work which would very easily have absorbed the full-time energies of three able men. The instructions which the Military Board were instructed to convey to him, if they were to be carried out with any degree of efficiency, were to require all his powers.

These were: (1) To complete a survey of the existing teak forests and of places suitable for fresh plantations; (2) to report on the condition of the several forests and their capabilities under proper management; (3) the means of increasing and perpetuating the resources of the Province by the appropriation and plantation of new tracts; (4) to submit a scheme for the supervision of the forests, consistently with the rights of the grantees; (5) to define and note the

boundaries of each existing grant ; (6) so far as possible, to discourage the practice of cutting up valuable timber into pieces.

About the time of Tremenheere's appointment Blundell was ordered, in March, 1841, in concert with Mr. J. R. Seppings, Surveyor of Shipping, and Captain Johnstone, Controller of Government steamers, both of whom were then at Moulmein, to report on the means in the Tenasserim Province for building teak men-of-war for the Royal Navy. The lines of the enquiry were to relate to the facility of procuring timber and its quality and abundance ; the fitness of the locality and river for building large vessels and the tonnage and draught of water to which vessels could be built at Moulmein ; and finally, an estimate of the prices of building ships at Moulmein was to be prepared and a definite opinion was to be expressed as to whether the project could be recommended. All this information had, in fact, already been collected and submitted by Halsted in his report to Lord Auckland recommending Moulmein for this purpose, but that report was not before Government when these instructions were issued. The Memoranda submitted by these three officers merely confirmed Halsted's statements that Moulmein was eminently fitted for the purpose in view. Seppings suggested the formation of a Timber Department at Moulmein, and recommended the purchase of Natmoo, the building and timber yard of Cockerell and Co. This place had been originally selected by a Captain Warwick, who was the first European who felled timber and brought it down to Moulmein from forests which he leased under the 1829 rules. He had subsequently become involved in pecuniary difficulties and his yard and right of cutting in the forests was transferred to Cockerell and Co. Captain Johnstone had surveyed the passage from Amherst to Moulmein in 1826-27, and was of opinion that there was sufficient depth of water for launching and floating the largest class ship, and that as the soil was of a hard and stiff nature, little preparation would be required "for laying blocks and ways for the heaviest ship."

On receipt of these reports Seppings, who had gone back to Calcutta, was directed (24th March, 1841) to return to Moulmein and there institute minute enquiries "as to the feasibility or otherwise of building ships of war at that port."

Meantime Blundell, acting presumably on Lord Auckland's suggestions (already noticed) that the forests should be reported on by a temporary officer, had deputed Captain

O'Brien, of His Majesty's 63rd Regiment, to survey and report on the Attaran forests. The instructions given to O'Brien were most carefully drawn out, and showed that the Commissioner had by now arrived at a very clear idea of the information it was essential to obtain on the subject of these forests, if they were to be preserved. Also, he was evidently anxious to justify the recommendations he had already submitted and which had not received the approval of the Governor-General.

O'Brien's report did not give all the information called for by Blundell, but it showed that several forests had been entirely neglected by those who held licences to cut in them ; that some forests had been completely worked out without any authority whatever ; and that others had been abandoned, owing apparently to the difficulty of transporting timber from them. In submitting this report to Government the Commissioner enquired whether these forests should not therefore be resumed, " and if resumed whether, together with forests that may be hereafter discovered, they should be given to private individuals, or remain to be worked by Government for the Royal Navy."

The Commissioner's queries raised two points for consideration—the first, what should be considered as constituting neglect or, in other words, failure to work a forest grant ; and the second, what remuneration should be made to grantees for trees killed or felled by them, but not removed from the reserved forests ? Blundell was requested to draw up rules which would define the first of these, " leaving the second to be determined with reference to the particular circumstances of each case."

Briefly, the Rules drafted, dated 12th April, 1841, were as follows :—

1st. *The farmer or licensee to keep up such an establishment for preserving and working the forest as determined by the Government Superintending Officer and to fell and extract the trees without injury to young growth. He must maintain a sufficiency of men, elephants, trucks, carts, etc., for this purpose.*

2nd. *That no trees of less girth than 6 feet at 10 feet from the ground should be killed or felled.*

3rd. *That every tree shall be killed by being girdled by removing 1 foot of bark all round at a height not exceeding 2 feet from the root of the tree and cutting down through the sapwood, so as to entirely interrupt the upward flow of the sap. This girdling to be done only during January, February and March.*

4th. That no tree be felled till at least two years after being girdled.

5th. That every tree felled be removed from the forest with the least possible delay.

6th. That for every tree felled and removed five young trees of a proper size shall be planted by the licence holder or by Government at the expense of the former.

7th. That no tree shall on any account be cut up into short lengths (called loozars), but that every tree shall be removed as felled and be brought in that state (after removal of branches) either down the river to the town, or to saw pits established in the forest.

On proof of breach of the above rules, the locality wherein such breach may have been affected will be at once resumed by Government.

The transfer of a lease of any forest from one party to another must be registered in the office from which the leases were issued, and no transfer shall be valid without registry.

The duty on timber will continue to be levied as usual.

As is abundantly evident from their nature it was essential that a Conservator should be appointed if the rules were to be enforced. Blundell, holding that Tremenheere's other duties would preclude him from devoting the time necessary for this purpose, in submitting the latter's first report, suggested the appointment of an officer as Conservator alone on Rs.750 a month with an adequate establishment. The expenditure would be amply repaid, he maintained, by the timber that would be sent down on account of Government. He suggested that the Commissariat elephants, at the time unemployed, should be made over to the Conservator for the conveyance of timber, and finally suggested that O'Brien should be appointed to the latter post. In anticipation of sanction he carried out these arrangements.

Just previously to this new plan for the working of the forests Blundell had forwarded to Government Sepping's second report on the adaptability of Moulmein as a dockyard, and recommended that this officer should be directed to fix his headquarters at Moulmein to carry out the operations suggested in his paper.

The three reports submitted to Government by Blundell were from O'Brien, Tremenheere and Seppings. Before dealing with the Government orders upon them it will be necessary

to briefly glance at the statements and suggestions they contained.

Captain O'Brien's Report. This has been already dealt with.

Captain Tremenheere's Report. Tremenheere left Moulmein on February 26th, 1841, to join O'Brien, who had already been despatched by the Commissioner, and fell in with the former officer on the Zimmé River above its junction with the Weinyo, in that portion of the forests where the grants were principally held by natives. An inspection here showed that every tree worth cutting had been felled in a green state, and many young trees had been cut down; on the opposite bank the same state of affairs was disclosed. Tremenheere stopped the felling work and recommended the suspension of all the grants for a time.

The two officers visited the Nat-choung River, on which Mr. Agar had a forest, and Goonjee, where Captain Richardson was at work, and then went up the Ghyne, the upper part of which is called the Houndrow, "a clear deep stream about 100 yards broad, but the smoothness of its course disturbed by a bed of limestone rock." They followed the stream to its junction with the Authan and found well-grown teak growing in patches on the left bank, there being no teak on the right bank though the soil and circumstances of both banks appeared identical. Tremenheere suggested that extensive plantations might be formed here. The Houndrow was well adapted to the flotation of teak in the monsoon. Higher up he came upon some excellent teak with straight stems of great dimensions, which he ascribed to the elevation, 1100 feet, where he thought teak flourished better, the climate being "temperate, only 76° on the same day that the thermometer stood at 82° at Moulmein." This place was only six hours' journey from the Shan territory. He made some interesting remarks on the slowness of the growth of the trees here as contrasted with the plains, showing that a return might more easily and speedily be expected from planting in the plains, where carriage facilities were also easier.

He prepared the following stem or growth analysis, taking trees growing on the Goonjee and the Authan as types of the low country, and trees on the Houndrow as types of trees growing in elevated situations to support his argument. The table he drew up is given below and is of high interest, since it is probably the first ever prepared in India. The records show no earlier one.

No.	Situation of the tree.		Number of rings from the centre.	Total $\frac{1}{2}$ diameter of these rings col- lectively.	Total age of tree.	Circumfer- ence.
				In.	Years.	Ft. In.
1	In the Plains	On the bank of the Authan	The first 20 rings The next 7 „ The next 10 „ The exterior 45 „ The first 41 rings The next 19 „ The next 9 „ The exterior 19 „ The first 55 „ The next 19 „ The next 26 „ The exterior 37 „	10 $3\frac{1}{2}$ $2\frac{1}{2}$ $2\frac{1}{2}$ 14 $4\frac{3}{4}$ $1\frac{1}{2}$ $1\frac{1}{2}$ 15 2 $3\frac{1}{2}$ $4\frac{1}{2}$	82	8 0
2	Do.	Do.			88	9 6
3	Do.	A Loozar found in the bed of the Au- than			137	12 0
4	Do.	On the bank of the Goonjee	The first 7 rings ; the exterior 15 were of soft wood	—	86	6 6
5	—	Another tree do.	In all 80 rings	—	80	7 6
6	1100 ft. above the sea	On the bank of the Houndrow	The first 91 rings The exterior 123 „	12 10	214	10 0
7	Do.	Do.	The first 100 rings The next 100 „ The exterior 63 „	11 6 4	263	11 10
8	Do.	Do.	The first 92 „ The next 74 „ The exterior 46 „	$13\frac{1}{2}$ $6\frac{1}{2}$ $2\frac{1}{2}$	212	10 7
9	Do.	Do.	The first 76 „ The next 90 „ The exterior 50 „	$12\frac{1}{2}$ 7 $2\frac{1}{2}$	216	11 0
10	Do.	Do.	The first 44 „ The next 67 „ The exterior 110 „	$2\frac{1}{4}$ 7 6	221	9 6
11	Do.	Do.	The first 40 „ The next 30 „ The next 20 „ The next 100 „ The exterior 43 „ The first 88 „ The next 52 „ The next 30 „ The next 30 „ The exterior 51 „ The first 142 rings	$5\frac{1}{2}$ $6\frac{1}{2}$ $2\frac{1}{2}$ $7\frac{1}{2}$ $2\frac{1}{2}$ 16 5 2 1 $3\frac{1}{4}$ 28	233	13 0
12	Do.	Do.			251	13 3
13	Do.	Do.	The next 35 „ The exterior 40 „	4 2	217	12 0

The following note is appended to the above table:—

" Nos. 1, 2, 4 and 5, from the closeness of the external rings and other characters, had every appearance of mature trees ; the principal increase in these cases took place during the first 40–60 years of their growth, and the increase of bulk after that period, or for the next 40 years, is extremely small ; whereas with those of higher situations on the Houndrow the difference of rate during the succeeding periods was much less distinctly marked, the advance of the tree being throughout accomplished by very slow degrees. The average age of full-grown trees on the Goonjee and Authan was 84 years, and of those on the Houndrow, 228 years. The average breadth of annual rings of the former was a quarter of an inch, sometimes separately exceeding one inch ; the average breadth of those of the Houndrow was one-tenth of an inch only, and seldom amounted separately to one-fifth of an inch."

For the Indian Forest Officer it is of interest to realise that this information on the rate of growth of teak was written eighty years ago and to reflect how much quicker would have been the advance of scientific forest conservancy in the country had work of this kind been carried out and received the support of the Government ; and how much greater the proportion of fine forest which would have escaped the destructive handling of the licence holder.

Tremenheere remarked that timber had been felled by natives in some of the forests on the Houndrow, but not extracted owing to the want of means, and advised its purchase by Government and removal by Commissariat elephants. He also recommended that Government should retain for its own use the unoccupied forests in the Weinyo, visited by O'Brien, as these contained valuable timber. " Independently of their value, their retention by Government would have a beneficial effect on the grantees, who seeing the possession of them valued by Government would be more careful than they had been of their own areas and might even commence culture and propagation in them ; for no seed had been sown by anyone possessing grants." He also particularly recommended that the Mittigate Forest (visited by Wallich) should be retained, as the timber could only be extracted by being dragged by elephants overland for 6 to 8 miles, owing to the river being unfavourable for transport. And only Government could do this, mainly by employing Commissariat

elephants. He concluded with some notes on the geological features of the country.

Mr. Seppings' observations. The information upon which Seppings based his opinions of the resources of the teak forests is not apparent, but he took a pessimistic view of their capabilities. He thought the supplies of teak from the Tenasserim Provinces had been greatly overrated, and that the tracts of land where teak was procured were not forests of that timber, but merely " patches of teak trees " which were met with here and there, interspersed with other kinds of timber. The whole of the available teak timber then at Moulmein for sale and shipment was estimated at 2000 tons of good straight timber. In the preceding nine years teak timber to the extent of 5000 loads had been annually exported, but that quantity could not be exported for ten years longer without exhausting the teak districts then known. Crooked teak, of sizes suited to the frames of line-of-battle ships, was procurable, but not in large quantities. A two-decked ship might have been built in five years at Moulmein, but a frigate was recommended to be built first, in order to test the capacity of the teak districts. There was sufficient timber at Moulmein to build, in two years' time, a 36-gun frigate, with hull completely copper fastened, together with masts, yards, and fittings, at £24 per ton—the sails, gunner's and boatswain's stores being supplied by the Crown ; whereas the hull only of a similar vessel, if built in one of Her Majesty's dockyards, would cost £25 per ton. The shipwrights were Burmans and Taliens, the joiners were Chinamen, the blacksmiths and caulkers were from Madras and Calcutta ; all were good workmen if superintended by Europeans. Ships could be built more cheaply, he considered, than at Calcutta or Bombay. He recommended Mapoon, 3 miles below Moulmein, as the best site for a yard.

Seppings drew attention to the importance of securing supplies of teak timber for the Royal Navy, and with that end in view suggested that no more licences should be granted, but that Government should retain the right to fell in all the ungranted forests. By this measure he thought 2000 loads of teak would at once be available and could easily be removed by elephants. He recommended also the employment of qualified persons to examine the teak and pine forests of the Shan territory, and the appointment at Rangoon of an Agent for purchasing timber for Government ; and concluded his

report by again recommending the establishment of a depot at Moulmein.

These journals and reports were unanimous in remarking upon the absence of teak seedlings, even where the teak was found growing in a wild state. No explanation was offered for this apparent absence, unless it could be attributed to the frequent burning of the jungle.

The reports were submitted to the Government of India on 2nd June, 1841, and Blundell was desired to convey the thanks of Government to Captains O'Brien and Tremenheere and Mr. Seppings for the information supplied by them. The only defect in the reports was the omission of all mention of other woods than teak. The Commissioner was authorised to secure the site at Mapoon "for forming a timber depot and, if it shall be so resolved, for building ships," and to retain the services of Captain O'Brien in order that he might explore the forests in the northern country and cultivate the friendly co-operation of the Shan Chiefs. He was also desired to do all in his power "to promote the security and facility of communications by land and water." The proposed entertainment of a paid Agent at Rangoon was not approved, but the employment of one or more resident merchants for the purpose of collecting timber, their services being remunerated by a commission, was suggested. The Commissioner was also authorised to collect all the timber he could for Government purposes and to employ the elephants, which were maintained in order to enable the troops to move at short notice, but who ordinarily had no work to do, in its extraction. It was considered that this would be a profitable method of utilising them in peace time.

The consideration of the proposed Rules was postponed, as the subject of forest control and superintendence was one that required much attention and very careful proceedings. Lord Auckland was unfavourable to any propositions which might tend "to an extensive disturbance, even of very unsettled occupations"; he considered that the primary object of the Conservator should be "to mark and define the boundaries of existing forest grants, and to lay down conditions of management"; and that if the occupiers consented to abide by them, they should be confirmed in their holdings, except to sites particularly required for public objects.

On the same date Wallich's opinion on the best means of perpetuating the supply of teak was asked for, and Lord

Auckland forwarded copies of all the papers to the Court of Directors. He invited an expression of opinion from the Court, both on the measures which had been taken and those which had been proposed for the management of the forests ; he also particularly called for the Court's orders on the proposal to form a depot and yard at Moulmein, and pointed out the advantages possessed by Moulmein for building ships for the Royal Navy.

Wallich's suggestions of 1841.—Fourteen years had elapsed since Wallich had submitted his valuable journals on his visits up the Salween and Attaran Rivers. The failure to follow the advice therein tendered had resulted in great devastation to the forests. In accordance with the request of Government he submitted a report on the 21st June, 1841.

Dealing with the question of the absence of young teak seedlings in the Tenasserim Forests, he considered it to be justly attributable to the destructive burning of the jungle (against which he had recommended precautionary measures in 1827), as this appeared to him to be the only rational explanation of the matter. He added : " It is a known fact that teak seeds will spring up in quantities wherever the tree is found, either in its wild state or planted by the hand of man, growing in forests or standing singly—and that the seedlings will continue thriving and become large trees unless checked by each other or by some dense jungle of other plants, or else destroyed by the firing of the forests." It was only necessary therefore, he remarked, for the preservation of them to cut down every other kind of timber and allow the teak to spring up naturally. " Some explorers," said Wallich, " may have unconsciously overstated the scarcity of seedlings, for the teak tree was completely deciduous, and it was possible that a casual observer visiting the forests during the dry months of the year would hardly recognise the seedlings in their twiggy and naked condition, and might therefore be easily led to an inference that seedlings were never found in the natural forests." He thought, therefore, that the officers who had visited the forests might in some measure have overlooked the seedlings. An opinion which the trained Forest Officer will readily endorse. He had no doubt, nevertheless, that the true cause for their *general absence* was ascribable to fires, " and by removing that cause a ready mode would be secured of filling up the vacant spaces of the forest."

Wallich's remarks and opinions on this subject expressed at so distant a date are of high interest in view of the fact, as will be shown, that this highly important point remained still a matter of expert controversy eighty years later.

His measures, not in many cases very practical measures, for securing natural regeneration and its protection were as follows: Prohibition of the firing of the coppice or under-growth; free the lands from jungle and loosen the soil a little under the trees about the time the seed was expected to ripen; protection of the young plants against injury from the annual burning of the tall grass, "which overruns all waste lands in those parts"; by fencing or other means to keep away wild elephants and other harmful animals; the establishment of local nurseries in the neighbourhood of each of the principal forest tracts and of a general nursery at Moulmein.

These suggestions were communicated to Tremenheere, who was now in charge of forest conservancy. It was considered that the soil at Moulmein was unsuited to the growth of teak, and he was requested to report on this point after visiting the forests.

On 8th September, 1841, the Rules, dated 12th April, 1841, were approved by Government, but Blundell was informed that the Government did not wish to disturb the occupancy of the grantees unless on very strong grounds; he was, therefore, ordered to report on the practical operation of the rules before proceeding to enforce the penalty clause, especially with reference to the cutting up of the timber, which it was thought could be adequately prevented if the duty could be secured by any other arrangement. This object was eventually effected by calculating the duty on the cubic contents of each log, without reference to its size, and levying the *ad valorem* duty of 15 per cent on a commutation price of Rs.30 per ton of 50 cubic feet. It was also decided to acquire the land at Mapoon on "mere sufferance," the occupancy to be withdrawn at the pleasure of the public authorities.

Owing to the great rise in the price of teak timber at this time Blundell proposed levying the duty in kind in order to collect a great stock of timber instead of in money, as had been the usual method from the start, although it had always been open to the Commissioner to collect the duty either way. The Government disapproved of the suggestion, and prohibited Blundell from making any purchase of timber, owing

to the increased price, which had not previously been approved by a competent judge of its quality and value.

In January, 1842, Tremenheere forwarded suggestions, through the Military Board, on the subject of establishing a few centrally situated nurseries instead of having a nursery situated in each forest, as it appeared that the grantees were either unable or unwilling to plant young trees.

If the literature on the subject of the lumbering to which the forests of both the Old and New Worlds was subjected throughout the nineteenth century is perused it will be discovered that in innumerable cases the grant to the lumberers was made with the proviso that they should replace the old trees felled by planting or by such other measures as would ensure a future crop on the area. With but few exceptions the grantees took no steps to carry out the stipulation, or the various Governments to enforce it. Burma proved no exception to this general rule.

Teak was now being brought down the Salween River to Moulmein from the Shan States, and the timber merchants made a great effort to get off paying the duty on it, claiming that Moulmein was a free port, and that duty on the timber had already been paid to the Shan Government. The Government of India refused the plea, deciding that as the Shan timber only derived its value from the circumstance of its being available for the Moulmein market, the inland duty of 15 per cent levied on it should be retained.

This order on the part of Government differed, however, from their pronouncement of 1837 (p. 146). For the Commissioner, according to the latter, had really had no authority for levying duty on foreign timber previously to this last order of 1842.

The Conservator and one of his assistants had meanwhile been inspecting some of the forests held by grantees, and in September, 1842, the former submitted a report on his tour.

In the forests visited (on the Attaran) he stated that the Rules had been entirely disregarded ; many undersized trees had been killed and felled ; many trees had been felled before being killed, or before the prescribed interval between killing and felling ; many trees had been killed for several years and had not been felled ; and a great many trees had been killed and felled above the killing mark. The general excuse put forward was that the non-observance of the Rules was due to the native contractors and their employees. Even if the

grantee wished to observe the Rules (as in the case of Mr. Richardson, who had instituted a suit in the Commissioner's Court against one of his native contractors for damages sustained by the violation of the Rules) the native contractors would not do so. Further, the Conservator said that the opinion prevailing amongst the natives was that the Government did not desire to have all the forests thrown on their hands and that consequently the extreme penalty of the resumption of the grant would never be enforced.

The Conservator proposed a revised set of Rules dated 11th July, 1842. These Rules were based on the practical experience he had gained by visiting the forests.

The main differences were that the boundaries of the grant were to be definitely defined in the lease, no proprietary right to the soil being conferred, the period of lease not being limited so long as the lessee observed the Rules.

Rule 1 required the lessee to appoint a responsible Agent to be resident in the forests during the killing, cutting and rafting seasons.

On 1st December each year each lessee should inform the Conservator of the full strength of his working parties to be employed in the forests, and Government peons would be deputed to place a mark on each tree to be killed and on each log to be brought away, the peons to report the total number, the report to be signed by the lessees' Agent.

2nd. The position of the mark to determine the killing and felling point which may be immediately below, but not above it. Marked trees to be killed the same season, and no unmarked trees to be felled.

3rd, 4th and 5th resembled previous Rules, except that only one rainy season need separate girdling and felling instead of two.

6th. No rafts were to enter the Moulmein waters without a pass, bearing the signature of the Agent employed to inspect them.

7th. For every tree felled or log brought away three young trees shall be planted on their timber sites. This will be effected by Government employees and the expenses recovered from the leaseholder.

Leaseholders will be charged 2 annas for every tree or log marked to cover the expenses incurred in the marking. Any surplus over the annual outlay incurred for marking will be put against the planting expenses.

As regards penalties, infringement of Rule 1 would forfeit the right to send timber down to Moulmein during the following

year. Breaches of other Rules would be met by a fine up to Rs.500, to be levied at the discretion of Conservator.

The Conservator visited forests on the Weinyo River at its junction with the Thengan-nyee-Nyoung, and in the Mittigate Codoogway, in which areas he found that many trees had been girdled although no grants had ever been given in them. He confirmed O'Brien's Report of the great extent of the latter forests and of the excellence of their timber, and recommended that they should be worked by Government. Tremenheere found the same state of affairs to exist at the head of the Houndrow. He particularly asked for the orders of Government regarding the leasing out of these ungranted forests.

The Conservator estimated the timber remaining in the southern forests on the Attaran, Weinyo and Houndrow at about 20,000 trees fit for felling, and in the northern forests on the Thoung-yeen, Salween and Llang-booa at 7000 trees, exclusive of young trees, which were numerous in that direction. The teak on the northern boundary of the Thoung-yeen River was said to be more abundant; but the forests there were held by natives, and little attention had been paid to them, the conveyance of the timber being difficult. The following extract from Tremenheere's Report is of very considerable interest, as it gives some insight into the amount of timber which was being extracted from the forests at the period and the form in which the material was being converted. "The quantity of timber which has been brought from the Government Forests to Moulmein between 12th April, 1841, and 12th April, 1842, is as follows:—

Locality	Long logs average 35 feet.	"Loo-zars" average 17 feet.	Mast pieces.	Squares 30 feet 12×12 and over.	Crooks.	Bend planks 30 feet 12×6 and over.
From the Southern Forests, Attaran and Weinyo . . .	4798	2103	35	461	13,563	1358
The Northern Forests, Thoung-yeen, Lhang-booa and Salween .	4771	1157	107	3	1390	130
Total from Government Forests	9569	3260	142	464	14,953	1488

"The amount of duty realised on all timber, including that from the Shan States, from 1st August, 1841, to 20th April, 1842, during the past commercial year is :—

On 8944½ tons, in cash	Rs. 36,121	5	3
On 2062 pieces of all descriptions, in kind, equal to . . .	13,019	8	3
Total of duty received in Company's Rs. this year (1841-2)			49,140 14 0

"The exports during this period have amounted to 8681 tons of teak, in value Rs. 2,60,430, at the lowest quoted price, of Rs. 30 per ton."

The large number of "crooks" shown in the above table is indicative of the demand for this class of material and gives the reason for the treatment of our home oak woods at the period, as seen in the old oak woods of the Forest of Dean, Windsor Forest and elsewhere. Heavy thinnings in the young woods were required in order to allow the trees plenty of room to branch and thus produce the crooks; and unfortunately the system was persisted in long after steel had replaced wood in ship construction and the demand for the wooden crooks had disappeared.

On the subject of nurseries the Report mentions that three had been established in three spots in the Attaran Forests, one at the junction of the Kyoon Geown and the Zimmé streams, a second on the bank of the Mittigate in the forest of that name, and a third on the Nat-choung stream about four tides' journey from Moulmein. The seed was sown in these nurseries in a fashion very similar to the first attempt of Conolly in Malabar. At the time the Report was written the Conservator had received no information as to whether the seed had germinated. His remarks prove, however, that the method of obtaining germination was at this period no better understood in Burma than in Malabar.

The Report concludes with an interesting list of other forest trees and their uses, the varnish tree being especially mentioned, the varnish obtained from it being, he said, extensively used in the lacquering of Burmese and Shan boxes.

The Commissioner approved of the revised Rules which were sanctioned by the Government of India with the alteration that five young trees instead of three, as suggested by the Conservator, should be planted in the place of every tree felled. The Conservator (or Superintendent of Forests, as

he is sometimes referred to in the correspondence) was to be invested with magisterial powers to enable him to impose fines not exceeding Rs.500 for any breach of the forest Rules, and was authorised to employ some additional establishment for the marking of the trees as provided by the Rules.

The Military Board were of opinion that the forest leases should be limited to a specific period, but this was not considered practicable without a breach of faith with the licencees, though the Government appear to have had it in contemplation, and to have expressed the intention, in the event of granting leases for unoccupied forests, to limit such new leases to twenty years, renewable on expiration of that time, conditionally on the lessee's strict observance of the Rules. The grant of leases for unoccupied forests was in the meanwhile prohibited, pending the orders from the Court of Directors, on the reference which had been made to the Court by Lord Auckland.

It will be observed that the position in the latter part of 1842 had very appreciably improved. Had Tremenheere's Rules been given full effect to, and an officer of his ability been allowed to work them until they had become established in the forests, the later history of the Tenasserim Forests would in all probability have been very different.

In February, 1842, the orders of the Court of Directors on Lord Auckland's reference were received, and they acted as a great set-back to forestry progress in Burma. After reviewing the measures taken in the management of the teak forests, from the earliest period down to Tremenheere's appointment, they expressed doubts as to whether the Rules he had framed would be sufficient to meet all the difficulties which had arisen. The Court were of opinion that a proper survey of the forests was an indispensable preliminary to any new system, but thought it was scarcely possible for the Conservator, with the aid of any establishment which could be allotted to him, to exercise so minute and searching a superintendence over such extensive forests as would enable him to prevent the felling of other trees than those selected by himself, or to see that the business of planting was properly attended to. But even if such interferences were practicable, the Court considered it would be undesirable to commit to any individual powers so liable to abuse ! One can fully sympathise with Tremenheere's feelings when he read this pronouncement ; for he had already proved himself to be a man of more than average ability and

full of keenness and enthusiasm for the work entrusted to him.

In order to ensure the preservation of the forests held by private persons who, be it remembered, were not the owners of the soil, the Court were of opinion that it should be the object of Government to make it the interest of those persons to take care of them, and to remove all temptation to injure them. For this object long leases should be granted on condition of the payment of a certain percentage of all timber felled, and under an obligation not to clear the land for cultivation or to employ it for any other purposes besides plantations. The felling of timber below a certain size should be strictly prohibited (we have here an echo of the Madras controversy on this subject) : and a modification of the duty might be made to check the wasteful practice of cutting up large timber. The Court then enunciated the remarkable opinion, which in no case had been borne out by previous experience, that "the farmer would thus have an interest in the improvement of his forests, and would probably be inclined to plant of his own accord. Even if he neglected to do so, the self-sown plant, which he would no longer have any object in destroying, would in most other situations insure to some extent the perpetuation of the forests." This statement is made in the face of the opinions expressed by the botanical experts that a dense jungle at once took possession of the areas in which the old teak had been felled, thus preventing young teak seedlings from coming through ; and that if all the mature trees were cut out no seed bearers would be left to provide seed. The Court also suggested that it should be made obligatory on the farmer to supply the places of the trees felled by him, by forming new nurseries and carefully rearing the young plants until they attained maturity ; the Government should reserve to itself the right of forming nurseries at the farmer's expense, in the event of his failing to do so ; and that the Conservator should be allowed to exercise such a limited control over private (they had already come to be so designated) forests as would merely enable him to see that these conditions of the lease were observed. The Conservator should also attend to the Government Forests, and Government should reserve to itself a resource independent of the market by selecting for itself from the ungranted forests such as were conveniently situated, and sufficiently extensive, and placing them under proper management, so as to afford a constant

supply of timber, both teak and other useful kinds indigenous to the country.

This latter recommendation was a valuable one and would, had it been given full effect to on an adequate scale, have gone far to retrieve the position.

On the subject of the collection of timber for the Royal Navy and the construction of vessels of war at Moulmein the Court stated that Lord Auckland's Minute had been placed before the Lords' Commissioners of the Admiralty, but that their Lordships had declined to recommend the employment of the timber of the Tenasserim Provinces on the ground that there was reason to think it possessed no desirable qualities. The Court therefore desired the Government to abandon both these suggestions and to confine their attention to supplying the demands of the Indian Government.

In accordance with the sentiments and orders of the Court Tremenheere's attention was directed to the preservation of the forests held by private individuals ; he was desired to stop the collection of a stock of timber and to retain the unoccupied forests to supply the requirements of Government, working them with the Government elephants, when available ; or otherwise to have recourse to contracts. He was also to report on the arrangements to be made for the general management of the forests ; and on the subject of the unfavourable opinion entertained by the Lords of the Admiralty of the qualities of Tenasserim teak. The Marine Board were also asked to call upon Seppings to state his opinion on the latter point.

Seppings, in the Memorandum submitted on the subject, said that in his opinion the teak from Northern Malabar was the best on the market. "The great length of time several vessels built of Malabar teak have lasted, from thirty to fifty years—in some particular instances they have run nearly a century—makes me designate the prime Malabar northern teak the most valuable timber in the world for shipbuilding. It is, however, like every other kind of wood, liable to early decay if not properly or gradually seasoned by exposure to a moderate current of air after being felled."

Malabar teak, owing to the distance, was seldom imported into Calcutta and practically never used in shipbuilding there.

"Pegu and Moulmein teak is extensively used by the ship-builders of the Hoogly, and is the only description of teak imported in any quantity into the Calcutta market ; it is

bought in a half-wrought state, the logs or planks being squared."

"The Pegu and Moulmein teak is a coarse, porous, open-grained wood *when compared with Malabar teak*; its weight, when moderately seasoned or dry, may on an average be stated to be 42 lbs. per cubic foot, whereas the latter, Malabar teak, is from 45 to 52 lbs. per cubic foot on an average.

"The forests of Tongnyo and Sarrawaddi supply the whole of the Pegu teak. The first grows the best quality, the country being high and not flooded during the rainy season, whereas the latter is always in a swampy state, and part of the year covered with so much water as to allow the trees to be floated from where they are felled.

"Prior to the first importation of teak from Moulmein (since the Burmese war), Calcutta was supplied almost exclusively from Rangoon, but only with straight teak; the Moulmein market first imported crooked teak timbers, which sold at such prices as to induce the Rangoon merchants to send crooked timbers from thence; the quantity, however, is so very limited that the greatest difficulty is experienced at present upon the Hoogly in completing, without great delays, vessels of from 100 to 400 tons, entirely of teak."

Seppings said that Moulmein teak had not been in use sufficiently long to enable a comparison to be made with Malabar teak, but his long experience enabled him to say that "Pegu teak was not to be relied upon, particularly that of a pale brown, which I have seen go rapidly to decay." He complained that the imports of the Burma teak were generally of so very mixed a quality (the methods of killing, felling and seasoning described by Tremenheere sufficiently accounts for this), and the amounts so limited, that he found it almost impossible to select from them a sufficient quantity of prime timber (dark, close-grained teak) to build a vessel of 200 tons. Even inferior teak was, however, preferable to the sâl or sissoo timber brought to Calcutta during the last fifteen years, and, moreover, teak was not subject to the attacks of white ants and other "vermin." He quoted instances where white ants had severely damaged and made unseaworthy ships, in parts of whose construction sâl, etc., had been used. Seppings considered, however, that if properly selected, felled and seasoned the forests of Pegu and Moulmein would be able to supply "timber of the largest size and in sufficient quantity to meet the whole requirements of the royal yards of England.

I have particularly noticed in the batches of teak brought from the Tenasserim coast a species of dark-coloured teak (approaching to black) which appears to be of a superior description ; it is very tough, and the grain close and irregular. I am informed it is brought down from the forests mixed with the common or brown teak."

To the licence system and the absence of all supervision as to the size of trees felled, their proper girdling, and so forth, can be attributed the great disparity noticed in the quality of the teak imports from Moulmein, which thus brought the timber into disrepute both in India and at home.

Seppings mentions the Java teak as having been used for shipbuilding in India during the period the English governed that island, at which time it was imported in considerable quantities to Calcutta. This import had fallen off by now. It was considered to be of superior quality and probably, Seppings thought, nearly equal to Malabar teak.

In August, 1843, as the outcome of a suggestion from Major Broadfoot, who had succeeded Blundell as Commissioner, that the duty of 15 per cent should be levied on timber from Martaban at present coming into Moulmein free, the Government of India on 18th March, 1844, directed the entire abolition of the duty on the Martaban (temporarily levied) and on the Shan timber as well, and declined to sanction any import duty on foreign timber imported into Moulmein, a step which was approved by the Court of Directors. Broadfoot delayed carrying out this order concerning the foreign timber, considering it would cause a needless sacrifice of revenue ; but to meet the wishes of Government he reduced the rate of assessment. Subsequently Broadfoot's successor, Major Durand, reported these facts to Government and showed that after the changes which had been made in the mode of measuring and valuing the timber the duty amounted to only 5 per cent *ad valorem*, which he thought was a very moderate and unobjectionable tax. Under these circumstances the Government of India, on the 4th October, 1845, sanctioned "the levy of a duty of 15 per cent calculated on a valuation at the rate of Company's Rs.14 per ton on all timber imported into Moulmein, whether the growth of the Tenasserim Provinces or of any foreign territory."

In the letter above alluded to, Broadfoot also drew attention to the question of the salvage of timber, the first serious mention of this matter in the correspondence of the period

under review. Salvaged timber was timber which had drifted (broken away in floods during the monsoon usually) from its depot and had been recovered from being carried out to sea and lost. All Indian Forest Officers who have been in charge of river districts have an intimate acquaintance with the difficulties which result from this part of their duties. The writer made intimate acquaintance with their intricacy in Chittagong during the years he held charge of that division. The quantity of timber carried away by the floods was stated by the Commissioner to be enormous, and in the endeavours which were made to secure it "the whole course of the river became a scene of violence," and often the timber was detained by the salver and appropriated to his own uses.

The Commissioner therefore issued a "Circular Order" which provided for the protection of this timber and for the payment of salvage on its recovery. The native timber owners acquiesced in the order, but the Europeans objected to it on the ground that in America salvage was not allowed under similar circumstances. The Commissioner was instructed to ascertain the precise nature of the objections made by the Europeans, but no further allusions to the matter are extant in the records of the period.

A most interesting Memorandum entitled "Suggestions for the better regulation of the Timber Trade at Moulmein" was written at about this time by a Mr. O'Reilly and submitted to Government in August, 1846. Mr. O'Reilly was a gentleman who possessed considerable experience in the timber trade, and consequently some of his statements are rather *ex parte*, especially his strong advocacy of the disposal of the forests to traders in perpetuity, and that the Government's requirements in teak timber should be obtained by tender and contract with the respectable part of the mercantile community. But the Memorandum, putting the other side of the case as it existed at the time before the public, is of decided interest and value. And it shows how strong had become the pressure of the vested interests which had been allowed to accrue since Maingy's initial mistake in 1829.

Tremenheere's Rules of 1842 were generally approved by the Court of Directors in a Despatch dated 26th June, 1844, but they objected to the clauses which required leaseholders to report at the beginning of each season the number of men and animals they proposed to employ in the forests, and to the restrictions in regard to the felling of trees. "These regula-

tions," the Court remarked, "must often prove exceedingly vexatious, and they can only be enforced by means of a number of petty officers invested with powers which ought not to be placed in such hands"; they accordingly repeated their suggestion of giving long leases, on such conditions as would make it to the interest of the leaseholders to preserve the forests and maintain a succession of timber trees on their lands. The Court at the same time expressed their approval of the intention of Government to retain the ungranted forests in the Tenasserim Provinces to supply the requirements of the Public Service. It is of interest to note that for the three years, 1841-2 to 1843-4, the receipts from the forests of the Amhurst, Mergui and Tavoy Provinces were Rs.133,481 the total charges being Rs.2093, or about $1\frac{1}{2}$ per cent of the receipts.

About the middle of 1844 Tremenheere deputed his assistant, Mr. Maling, whose salary had now been augmented to the scale of a senior sub-assistant in the Survey Department, to survey and report on the Thoungh-yeen Teak Forests, as yet unsurveyed. The object in view was the adoption of proper measures for protecting those engaged in the timber trade, and more particularly the oppressed Karens who inhabited these forests.

The forests inspected by Mr. Maling were situated on the River Thoungh-yeen which rises in the mountains called Kyokhet, about 120 miles from Moulmein, the river emptying itself into the Salween at the then northernmost point of British territory, about 80 miles from Moulmein. Some very fine teak forests existed in this area at the period, and padauk was also noted as plentiful in parts. The Karens practised shifting cultivation, or toungya, as it is called in Burma, and Maling noted that a great number of trees were destroyed annually in making clearings for this cultivation. They preferred spots where young teak abounded to any other, the soil being generally richer and well elevated. He noted that young teak of all sizes was present in all the Thoungh-yeen forests, and bearing in proportion of ten to one to the old trees; in some places young pure teak crops spread for miles.

Tremenheere remarked on this Report that he was of opinion that the Karens of the Thoungh-yeen Forests should have an actual, and not merely nominal, property in the timber of their native forests, precautions being taken to prevent monopolies. He thought it would be sufficient to fix a felling

girth limit, severe penalties being enforced for all fellings below the limit and for timber brought down before it was properly seasoned. The penalties could be easily enforced when the rafts were inspected for payment of duty. Since natural regeneration was abundant no measures for renewing the forests were necessary. No orders were issued at the time on these recommendations, as the Commissioner, then Captain Durand, was investigating the state of the Karen population in the Thoung-yeen.

On 2nd October, 1844, Durand reported having directed the partial removal of "the restriction which Broadfoot had issued on 2nd August, 1843, for the killing and felling of timber in the Thoung-yeen Forests." This order is stated to have been given with a view to check "the system of oppression under which the Karen inhabitants of the Thoung-yeen districts had long suffered."

It appears that timber-cutters had proceeded to the Thoung-yeen Forests, in which the Karens seemed to have possessed forest rights, and without authority had cut timber, employing the Karens themselves to girdle and fell the trees, and either not paying them for their labour or maltreating them. Broadfoot's prohibition put a stop to this so suddenly that the timber-cutters were not allowed to remove the trees which they had already girdled and felled. Durand now permitted some of these interested parties to proceed to the Thoung-yeen Forests, in company with a Native Officer deputed for the purpose, to bring "away" this timber. Durand was anxious to conciliate the Karens and to induce them to settle along the Thoung-yeen Valley, as the ill-treatment they had received at the hands of Talayens, Burmese and other classes for a long series of years had driven them to employ fire and other means of diminishing the value of their forests, in order to obtain freedom from oppression by discouraging the visits of strangers. The Commissioner's idea was to protect the Karens from the acts of the timber merchants and their employees by making the Karens themselves the conservators of the forests on the Thoung-yeen, and he issued instructions with the object of securing to these people their common rights as British subjects, and of leading them to value these rights.

In February, 1845, instructions were issued for levying the duty on timber in money instead of in kind, and for the abolition of the Government timber depot at Moulmein, the Government in future to buy their timber requirements in

the open markets. This was a victory for the big timber merchants and their vested interests through which the forests were to suffer severely.

Captain Guthrie had succeeded Tremenheere as Executive Engineer and Superintendent of Forests in the Tenasserim Provinces, in September, 1845, and we find the Military Board submitting to Government, in April, 1846, a correspondence on the conservancy of the forests which they had had with Guthrie. This and other extensive correspondence regarding the proceedings of Guthrie in the Forest Department since he succeeded Tremenheere down to September, 1846, was printed in a Memorandum, dated 15th August, 1848, by an order of the House of Commons, the Memorandum being entitled, "*Copies of all Reports which have been made to the India or Home Government respecting Teak Forests in the Tenasserim Provinces.*" This paper is too long for full transcription here, and much of it traverses ground already dealt with in this section. A brief summary of Guthrie's operations will, however, be necessary to carry on the continuity of the forest work. Almost the first steps taken by Guthrie, on assuming his new appointment, was an attempt to ascertain the extent and condition of the teak forests of the Province. With this object in view he himself personally visited the Thoung-yeen Forests as being the most important, and those of the Houndrow as being the least known. He deputed his Assistant, Mr. Salmond, to visit and report on the Attaran Forests on the Salween. The results of these investigations he submitted to Government in a long Report dated June 20th, 1845. As a result of these inspections Guthrie estimated the total number of teak trees in the Province at 194,000, as shown in the table on pp. 178-9, and he considered that number capable of yielding annually, without injury to the forests, 5000 tons of timber in the unoccupied forests, and 3050 tons of timber in those occupied by private individuals.

Guthrie's Report agrees in the main with all the views held by Tremenheere, and strongly supports the Rules drafted by the latter, stating that the Rules had proved inoperative chiefly through the non-enforcement of the penal clause. He accordingly proposed to resume all the forests in which the Rules had not been strictly observed, and he brought forward a set of new regulations which appear to have been drafted by Tremenheere in 1843, but not to have been put forward by him at that time.

These Rules were good Rules and were required to be given force to if the devastation of the forests by the timber merchants was to be prevented. Guthrie was merely following in the footsteps of his predecessor in office and, moreover, carrying out the policy advised a score of years before by Wallich. Durand supported the acts of his Superintendent of Forests, and several of the leased forests in which acts against the Rules had been committed were summarily resumed. Guthrie ridiculed the idea that any of the lessees would do anything of real value to replace by young growth the old trees taken out. He maintained that the work of regenerating and protecting the forests, as also that of ensuring that the marking, felling and extraction of the trees was properly carried out, was the work of the Superintendent and his Staff, and that the lessees could not be trusted to look after or improve their areas for future generations. He advised that the Superintendent of Forests should be allowed the power of a Joint Magistrate, in subordination to the Commissioner, the latter trying all cases in which the Joint Magistrate could not inflict a sufficiently high penalty. Guthrie concluded his Report with a request for the instructions of Government on the following points :—

1st. What are the views of Government regarding the disposal of the forests, those unoccupied and those in the hands of private persons ; whether to be granted to private persons on long leases, or the continuation of the present system of tenants at will ?

2nd. Regarding the working of the forests—if to be worked by Government ?

3rd. The periodical expenditure that will be sanctioned towards introducing the useful woods of the Province into notice.

4th. Regarding duties to be levied on other wood than teak, they being now exempt ?

5th. Regarding the artificial extension of forests, and the extent to which it should be carried out ?

As has been said, before the Report was submitted to Government, Guthrie, with the support of the Commissioner, had resumed several of the leased forests under the penalty clause of the Rules of April, 1841, for breaches of these Rules and for a total contempt for their existence and their provisions. Some of the resumed areas were held by Cockerell and Co.

ABSTRACT STATEMENT OF TEAK TREES CONTAINED IN THE TENASSERIM PROVINCES

Name of main river by which timber can be floated down.	Forest.	NUMBER OF TEAK TREES.				Grand Total exclusive of very small trees.	Remarks.
		Below 6 feet.	Above 6 feet.	Growing.	Killed and Felled.	Total.	
Zimmé River	Forest in the possession of Europeans and also forests worked and occupied by natives . Unoccupied forests, Mittigate, Codoog-way and Kyonk-Taga .	35,898 3,513 — 42,986	39,411 12,718 1,821 46,499	5,669 18,387 299 14,539		57,798 18,387 2,120 20,507	
Weinyo River	Forests occupied by Europeans and others . Unoccupied forests, Allantria, Thengan-nyee Noun, Mane and Tagoondine .	14,485 369 — 5,825	14,854 2,202 — 5,825	2,494 — — 3,279	17,348 292 — —	9,104 5,773 26,452	Government.
		20,310	369	20,679	5,481	292	

Almost all of the forest holders here have, I believe, written authority for their working, and hence at present they cannot be considered certainly available for

Salween and Lhang-booa	Forests on the Lhang-booa and Salween, all of which have been worked, or are in possession of some one .	10,000	1,120	11,120	2,900	640	3,540	14,660		The trees are generally peculiarly hard and sound, but not straight, and well adapted to produce crooked timber.
Houndrow	In different places, have been worked at one time and another by natives .	1,121	150	1,271	473	270	743	2,014		
Thoung-yeen River	Thoung-yeen forests now free, and available for Government: Upper Thoung-yeen Middle " Lower "	2,000 24,000 25,000	— — —	2,000 14,000 4,000	11,000 2,700 1,070	200 5,070	11,200 16,700 5,070	13,200 40,700 30,070		No authority held by anyone, and well available for Government; none of this teak has ever been brought to Moulmein; the fibre close and firm, some trees large, but irregularity of form would prevent its cutting up well.

and Mackay and Co., of Calcutta, and these firms appealed to Government against this resumption. Instructions were at once sent to the Commissioner, Durand, to restore the sequestered grants to the holders "until the Government are in possession of such information as will enable them to pass final orders" on the subject. In spite of this order and the intimation of the opinion of Government on the subject, just previously made to Durand, that it was not intended "to monopolise the forests, or to restrain the free trade, or trench on the rights of grantees or lessees of the forest lands," Guthrie, with the concurrence of Durand, continued to enforce rigidly the penalty clauses of the Rules of April, 1841. These proceedings elicited from the merchants of Moulmein (represented by a Committee formed of Messrs. Creeton, Austin, Paterson and Maurel) a petition of appeal, dated 12th June, 1846, to the Commissioner. The petitioners complained of:—

"1st. The resumption of occupied forests under charge of breach of Rules, promulgated under date 12th April, 1841.

"2nd. The seizure of all wood brought down during the present season under 6 feet in girth, and the subsequent levying of a fine equal in amount to the Government duty on all such wood being released.

"3rd. The prohibition to private parties from working timber out of the unoccupied forests, with the avowed intention of working all such forests on Government account.

"4th. The recent regulations issued by the Superintendent of Forests in regard to the collection of duty on, and the passing of wood at, the Government station at Kadoo."

Durand, however, upheld the measures of his Superintendent and reported to Government his having done so. The Government then considered the whole question of the management of the forests from the time they had been thrown open to the public by Maingy in 1829, down to the period of Guthrie's appointment; and in a letter dated 7th September, 1846, addressed the following observations and orders to the Commissioner. After recapitulating portions of Guthrie's Reports and the remedial measures proposed by him, the letter continues:—

"In the meantime Captain Guthrie has not been slow to exercise the powers which he conceives himself to possess for the punishment of these instances of neglect on the part of

the grantees, and he has in several cases summarily resumed important grants under the penalty clause of the Rules of April, 1841, for breach of those Rules by felling undersized trees ; and these proceedings you appear to have approved and affirmed.

" It will have been observed from the foregoing statement that no confirmation of the penalty clause can be traced in the records of Government. If, therefore, any confirmation be forthcoming in the office of the Superintendent of Forests, a copy should be transmitted for His Honour's satisfaction. In the meantime, it would seem that Captain Guthrie has been acting under a Rule of no authority. But even if the Rule had ever been confirmed and authorised by Government it is by no means clear that its purport would have given the Superintendent of Forests any power to enforce so serious a penalty ; he might possibly have reported the facts and made his recommendations, but the infliction of the penalty would have lain with much higher authority.

" Independently, however, of these considerations, the enforcement of the penalty of forfeiture of grants for breach of Rules, which have been advowedly and notoriously a dead letter ever since they were enacted, and which the Government has never shown any intention or given any notice of enforcing, is a measure altogether oppressive and inequitable ; two mercantile houses of this City (Calcutta) have, as you are aware, appealed to Government against these proceedings and Government have been directed to suspend them for the present. One of the houses thus summarily stopped in their works and deprived of their grants of forest locations is known to be under a heavy contract with Her Majesty's Government for the supply of timber for naval purposes, and the consequences to them must be very serious."

The argument used officially in the first part of the above paragraph is as fallacious as it is extraordinary, emanating from so high an authority ; the statement in the latter part shows where the shoe pinched, and the vested interests stampeded the Government under the fear that the Government supplies of timber would not be forthcoming ; to get these the authorities were ready to allow their Rules to be openly broken in the forests and the forests themselves to be destroyed. After alluding to the petition of the Moulmein merchants to the Commissioner, complaining " very reasonably and respectfully of the sudden and ruinous measures of Captain Guthrie

to which you have signified to the petitioners your approval," the letter continues :—

" Upon the grounds already stated, the Deputy Governor most entirely disapproves them, and he directs me to request that no time may be lost in redressing the injury which has been sustained by ejected parties, and in reinstating them in the rights, of which they ought not in such a summary manner, or on such insufficient grounds, to have been divested.

" In regard to future management the Deputy Governor conceives the only sound principle to have been suggested in the few but apt words already quoted from the Despatch of the Honourable Court, dated 30th September, 1842, viz. that no Conservator with the aid of any establishment could maintain a proper degree of check over such extensive tracts ; that even if it were practicable it would be objectionable to commit such powers to one individual, and that the best and cheapest way of effecting the object would be to make it to the interests of persons to take care of their grants by giving them long leases.

" This appears to the Deputy Governor to be a perfectly just view of the subject. Rules full of petty detail, teaching merchants and traders how to carry on the smallest details of their business, even to ropes and trucks and carts, and prescribing small and meddling instructions, to be enforced under heavy penalties, and this too throughout vast, distant, solitary and scarcely accessible forest tracts by one Conservator or Superintendent, with a few native subordinates (for it would not pay to have a large establishment) must, in the nature of things, fail of any good. The Rules would not be observed ; their infraction could not be checked, and the penalties could not be enforced. On the other hand, the measures taken with the grantees have been such as to ensure waste and improvidence. They have been sent at one time with permits to fell timber on given localities revocable at will ; at another, they have received grants of undefined and disputed tracts for no specified term, but dependent on the pleasure of the authorities for the time being. Even the desire of Government to grant leases for 20 years, as expressed in 1843, seems not to have been carried into effect, but, on the contrary, Captain Guthrie as Superintendent, and yourself as Commissioner, have taken pains to impress upon the grantees that their rights may be resumed at any time, and they have indeed been practically taught that resumption may occasionally

be very suddenly and summarily put in execution against them.

"It would be strange, indeed, if, under such circumstances as these, the grantees were found carefully guarding the Government interests in the forests, or establishing nurseries of young trees, or sparing to cut down whatever might soonest suit their purposes."

It may be pointed out here that in the lease which the lessees took up these conditions were all prescribed and accepted by the individuals who took up the grants and signed the contracts with Government. No allusion is made to this fact in the Deputy Governor's Despatch.

The Deputy Governor's letter continues :—

"The Grantees have been obliged by their position to make the most they could in the shortest time, out of a very precarious and uncertain tenure, and their conduct has only been what might have been expected from them.

"The obvious remedy is to do as the Court recommend, viz. make the interests of the grantees correspond, as far as possible, with the interests of Government.

"The interest of Government is, that as much timber as possible should be brought to market without injuring the forests or destroying their future productiveness. To make the interests of the grantees identical with these, he should have a permanent property in the forests, and no further restrictions should be placed on him than that the grant shall become liable to the payment of land revenue if ever it is denuded of trees and brought under the plough. The property conveyed by the grant should include not teak only, but all trees and products of the forest. The duty levied at Moulmein should be heavier in proportion, as the logs are below a given size, and all below a certain girth, to be fixed as a minimum, should be confiscated.

"The Honourable Court have, in the case of the grants at Mergui, claimed by the Countess Nostilz and Baron des Granges, sanctioned leases for a term of 99 years, and the Deputy Governor does not conceive himself authorised, without further reference to the Honourable Court, to grant leases for any longer term. But it is shown in the reports of Captains O'Brien, Tremenheere and Guthrie, that teak does not attain to any large size under 80 years, and it is therefore obvious that grants of such forests should be in perpetuity, subject to a land-rent on the usual terms, for any part of the land at any

time brought under cultivation. The Deputy Governor is strongly of opinion that the system should be pursued in regard to these forests which prevails in the Crown Colonies, i.e. that the locations should be sold outright, and a complete title conveyed to the purchaser. A recommendation to this end will be immediately conveyed to the Honourable Court. In the meantime the Deputy Governor directs me to request that you will communicate with the existing grantees and those persons engaged in the timber trade, in order to ascertain their views on this subject; and you may also take early measures of surveying and defining the boundaries of all existing grants, as well as the particular localities which, in your opinion, had better for the present be reserved for Government purposes. On this part of the subject, however, His Honour entertains a strong opinion, and will express it to the Honourable Court, that the Government interests will be best served by attracting private capital and enterprise to work the forests, and trusting for Government supplies to the market.

"It will be proper that the Superintendent of Forests should take every possible means of establishing teak nurseries in fit situations, not within the boundaries of occupied grants; and it may be expected that grantees, when assured of reaping the fruits of their exertions, will themselves endeavour to propagate young trees within their localities."

The letter concluded with some remarks on the question of the revision of the duty on teak timber and on the ownership of the Thoung-yeen Forest question."

The Deputy Governor, Sir Herbert Maddock, reported these proceedings to the Court of Directors on 21st October, 1846, inviting the Court's attention to the preceding orders as containing an exposition of his views on the subject of forest management. Adverting to the opinion expressed by the Court in their Despatch of February, 1842 (see p. 169), Sir Herbert wrote: "I have endeavoured to carry them out, as far as I feel myself authorised to do so, by expressing my readiness to grant leases of forest lands for a term of 99 years, subject to no conditions, except those of payment of revenue at the established rates of the Province on all lands brought under cultivation—payment of a duty, fixed with reference to the size of the logs, on all timber brought down the river to Moulmein, and confiscation of all timber below a certain

size to be hereafter determined. But entertaining a strong opinion that, with reference especially to the slow growth of the teak tree, the creation of a permanent interest in favour of the grantees is required for the due preservation of the forests, and that this paramount object cannot be obtained by any other means, I beg earnestly to recommend that your Honourable Court will give the local Government authority to sell the whole of the teak forest lands in tracts of convenient extent, and to convey to the purchasers a complete title, subject only to the conditions expressed in the preceding paragraph."

The italics are the writer's, and fortunately this amazing suggestion of the Deputy Governor did not meet with favour.

The Court of Directors replied to the above letter on 20th October, 1847. They approved of the orders of Government for the restoration of the grants which had been resumed by Guthrie, but did not agree with Sir H. Maddock in his opinion on the subject of the leases, and prohibited "any fresh grants to be made until an extent of woodland, conveniently situated, and sufficient to supply the timber required for the public Service, has been selected and placed under the management of Government Officers." The Court's remarks on this subject show that they appreciated to some extent the inadvisability of alienating the forest area from Government control, though their allusion to the great teak jungles of Burma as "woodlands" must have proved a source of amusement to those acquainted with the former. The Court wrote as follows :—

" We are aware that you do not appear to admit the necessity for this precaution and you observe that 'the Government interests will be best served by attracting private capital and enterprise to work the forests and trusting for Government supplies to the market,' but we do not concur in this opinion. It is quite possible that not only leaseholders for 99 years, but even leaseholders in perpetuity may not think it worth while to form plantations which must remain for eighty years without yielding any returns of value, and that after felling the timber on these estates they may leave them waste or bring them under the plough. The latter course would no doubt be productive of much advantage, both public and private, but it might be pursued too far, and in any such case a stipulation should be introduced into the leases providing for the payment of the ordinary assessment on lands brought into cultivation. It is absolutely indispensable that a certain extent of forest

land should be preserved for the supply of timber, and that the valuable resources existing in the Tenasserim Provinces should not be exhausted through a repetition of the neglect which has proved so ruinous to those of Malabar. For these reasons 'Government,' as we observed in our despatch of the 30th November, 1842, 'should reserve to itself a resource independent of the public market'; and we must consequently repeat the injunction made in the same despatch, 'that before any further grants are made, some forests, sufficiently extensive, be selected and placed under proper management, so as to afford a constant supply of timber, both of teak and of other useful kinds indigenous in the country, for the wants of the Bengal Government as well as of the Royal Navy.'

This reversal of the policy introduced by the first Superintendent of Forests and continued by Guthrie resulted in the latter's resignation of the post, in which he was succeeded by a Captain T. Latter who, in a Memorandum dated May, 1848, reported on an inspection of the forests he made. A part of this Report was printed by order of Mr. J. R. Colvin who had succeeded Durand as Commissioner. Latter's Memorandum contained so many extraordinary statements and views, especially some curious and quite erroneous ideas on the mode of propagation of the teak, that it will serve no purpose to consider it further here.

Mr. Colvin, however, on taking over the Commissionership at the close of the year 1846, gave his attention to the important subject of forest management, and on October 28th, 1847, submitted an elaborate Report to Government "on the general question of the course to be followed in regard to the Teak Forests."

This Report was really in answer to the requests addressed by Government to Durand on 7th September, 1846. Colvin's Report, which is of too great length to be reproduced in any detail here, gives much valuable information regarding the forests, as also a complete exposition of his views on forest administration.

Colvin divided the Tenasserim teak forests into two great divisions. The first extending along the Attaran rivers (the Zimmé and Weinyo) in the south had a superficial area estimated at 225 square miles; the second on the Thoung-yeen River in the north with a superficial area of about 600 square miles. About half of the above areas in each division was supposed to have teak growing on it, the timber from the

Attaran regions being said to be of larger size and superior quality to that from the Thoung-yeen Forests.

There were three unoccupied forests on the Attaran, two of which Colvin proposed to retain for Government, the other, on the Mittigate and Upper Mittigate, being granted to Messrs. J. Mackay and Co. who had applied for it. For this forest and all the other occupied forests, Colvin proposed the grant of long leases for 99 years, but he favoured and strongly recommended the cession in perpetuity to the holders of licences of all locations which were occupied by them. But he did not wish this advantage to be enjoyed by the Burman holders of licences, since he thought it would be advisable to exclude "many of the Burmese holders of forests' licences who have not the means or the character from which to look for a useful result, were such a concession made to them." In other words, Colvin wished to favour the powerful European timber interests, and was prepared to place them in perpetual ownership of large areas of land belonging unquestionably to the Government and Public.

In the Thoung-yeen region alone he considered, reluctantly, that it would be advisable to maintain the arrangements which had been come to by his predecessors in favour of the Karens.

As regards the holders of the leases, he would let them work and extract the teak in their own way, and suggested the following as the only Rules necessary :—

" 1st. That the minimum girth of logs allowed to be prepared for duty be reduced from 6 to 5 feet.

" 2nd. That the duty be fixed on the log and not per ton at the rate of Rs.3 a log on all wood but that on the Attaran, and Rs.4 per log on the Attaran wood.

" 3rd. That below the standard of 5 feet girth no timber be allowed to pass beyond an allowance of 5 per cent for branches of trees and natural dwarf timber, etc., which proportion may be passed at half duty along with any raft of full-sized timber. Undersized wood in excess of this proportion to a full-sized raft should be confiscated."

Government replied to Colvin's Report on 24th April, 1848, furnishing him with a copy of the Despatch of the Court of Directors of 20th October, 1847, already alluded to. In this letter the Government agreed to all Colvin's recommendations so far as they were in accordance with the views expressed in the Despatch. The proposal to grant forest holdings in

perpetuity was therefore negatived, the Court of Directors having set their faces against any such grants.

Colvin was by no means satisfied with the position, and taking the Court of Director's Despatch as his theme pointed out (21st June, 1848) that in one place it was the Court's wish that the leaseholders should be encouraged to look after their grants and replant the areas cut over, and that to do this would only be possible if the grantee had his lands on a long tenure; whilst other clauses of the Despatch expressly forbade the wholesale disposal of the forest lands by sale outright or the grant, as he wished and proposed, of perpetual leases.

It is difficult at the present day to enter into the reasons which influenced Colvin to take up the attitude he so strongly maintained. For an official in his responsible position to advise and press for the sale to private parties of large areas of State-owned land, including the population resident or existing in the areas, appears to be so short-sighted a policy as to almost pass comprehension.

Colvin followed up his first letter with communications relative to the rates of duty to be charged on teak logs, Rs.4 for the Attaran and Rs.2.12 only instead of Rs.3 for each log brought down the other rivers.

In their letter of 7th August, 1848, Government authorised the adoption of the proposed scale of duty, and on 13th September following they sent a full report dealing with Colvin's recommendations, as regards the length of tenure of the leases, and the orders of Government thereon to the Court of Directors under instructions from the Earl of Dalhousie, the Governor of Bengal. The favourable consideration of the Court of Directors was solicited to the proposal of Mr. Colvin for converting the leases from ninety-nine years into grants in perpetuity. The Court replied to this report on 12th September, 1849. They disapproved of Colvin's proposal for granting leases in perpetuity, but sanctioned all other measures which had been suggested and those which had been introduced, the modified rates of duty included.

On the subject of the proposed leases in perpetuity, the Court wrote the following important pronouncement:—

"We cannot accede to any recommendation which would alienate from Government in perpetuity the proprietary right in these forests. We attach little importance to the argument urged by the Commissioner as we are of opinion that, where the prospect of obtaining any remuneration for the labour

and expense bestowed on the forest is so distant, as must necessarily be the case in regard to the plantation of young teak trees, a perpetual tenure would have little, if any, advantage over a ninety-nine years' lease, in inducing the grantees voluntarily to incur that labour and expense, where there exists no express condition to that effect. We consider that a far more effectual plan for securing a renewal of the forests on the tracts occupied by the present holders would have been to make it a condition of the lease that three seedlings should be planted whenever a tree had been cut down, and that any default in this respect (which might be ascertained by periodical inspections) should render the grant liable to resumption. Such a condition, if faithfully performed, could secure for the future a constant supply of teak timber, and it might be held out as an inducement to the lessees to exert themselves for the improvement of the forests, that if they were successful in that object, they might look forward to a renewal of the lease at the expiration of the present term."

The Court of Directors further were adverse to any proprietary rights being granted to individuals whether European or Native, to either the growing timber or the land in the Thoung-yeen Forests. In connection with Colvin's remarks and recommendations with reference to the Thoung-yeen Forests the Court observed that "in the proceedings of the local officers there appears to be a tendency to blend the right of property in timber with the fair reward for labour." The Court considered that the Karen inhabitants might "reasonably expect a fair remuneration for their labour in felling and preparing the trees, but they must not be allowed to have any right of property in the timber itself or in the land on which it grows."

These orders of the Court of Directors were communicated to the Commissioner of the Tenasserim Provinces on the 14th January, 1850, and bring the period here dealt with to an end.

Colvin had, in dealing with the question of the nurseries of young teak which had been established, especially the one in the Thengan-nyee-Nyoung Forest, applied for the services of an official from the Calcutta Botanical Gardens. As a result of this application Dr. Falconer, the Superintendent of the Gardens, was deputed on a tour of inspection of the Tenasserim Forests. This tour he carried out between January and April, 1849. His report will be dealt with in the next period.

An interesting paper was written, dated April, 1849, by Mr. O'Reilly, the author of the Memorandum on the Regulations of the timber trade at Moulmein already alluded to. In this second paper entitled "Observations in connection with the route across to the head of the Houndrow River," Mr. O'Reilly gives some valuable data on the extent and conditions of the teak forests as observed by him in the cold weather of 1848-49. Falconer's Report, however, covers most of this ground.

The following were the exports of teak from Moulmein for the years 1840 to 1848 inclusive :—

1840	..	..	..	..	4,952 tons.
1841	..	..	..	..	6,399 "
1842	..	..	..	..	11,487 "
1843	..	..	..	..	10,528 "
1844	..	..	..	..	14,245 "
1845	..	..	..	..	13,360 "
1846	..	..	..	..	16,798 "
1847	..	..	..	..	11,250 "
1848	..	..	..	..	18,000 "

" to which may be added 3,415 tons appropriated to ship and house building and other purposes, giving a value, at the rate of 40 rupees per ton, of Company's rupees 869,800 as an annual amount derivable from this commercial staple of Moulmein."

When it is remembered that fellings somewhat on this scale had been going on for a score of years it is not surprising that the Tenasserim teak forests were ruined !

CHAPTER X

FOREST OPERATIONS IN UPPER INDIA—NORTH-WEST PROVINCES
AND OUDH, CENTRAL INDIA, PUNJAB, BENGAL AND ASSAM,
1796-1850

THE FIRST MEETING OF THE BRITISH AND THE GURKHAS

EARLY in the beginning of the nineteenth century the British experienced considerable trouble with the Gurkhas. The latter had come into notice about the middle of the eighteenth century, at the time Clive fought and won the battle of Arcot, and had gradually assumed a dominant influence over the whole of the extensive valley and hills of Nepal. During the second administration of Lord Cornwallis (1786-93), who was the first Governor-General to be appointed also Commander-in-Chief, the Gurkhas had acquired territory which had a land frontier on the English side of 700 miles. Disputes arose between them and British feudatories on our side of the frontier. The Gurkhas besieged Bhootwal (a border district of the ancient viceroyalty of Oudh); and in succeeding years carried out a series of invasions into British territory. In 1813 the Governor-General, Lord Minto, demanded a return of all the usurped territories. Lord Hastings, who had succeeded Lord Minto as Governor-General, received what amounted to a refusal to this demand. The British were reluctant to engage in hostilities with the Gurkhas for many reasons and endeavoured to settle the matter amicably. The negotiations were broken off abruptly by the latter, and a British detachment was sent from Gorakhpur to occupy the disputed territories. This was done, native officials were placed in charge, and the British troops withdrew. But the arrangement showed how little the character of these northern mountaineers, who had ousted the petty Hindu chieftains and assumed sway over the tract of country at the foot of the Himalaya running from the Sutlej in the west to the Tista River in the east, was understood by

the British authorities. These Hindu rajahs had previously been tributary to the Mogul and received in return protection from the aggression of the lawless hill-chiefs, most of whom maintained their independence ; though some were content to own a sort of vassalage to the empire in return for the possession of a portion of the magnificent sâl forests of this region and of the rich plain called the Terai lying between them and Hindustan proper. The hill-chiefs had warred upon the plains people from time immemorial and had held their own till the decline of the Mogul Empire. It was the news of the early victories of the English in Bengal which incited Prithi Narayan Sah, Rajah of the small state of Gurkha, to arm and discipline a body of troops after the European fashion, and with these he gradually subdued and absorbed all the neighbouring petty states, exterminating the family of each chief as soon as subdued, to avoid trouble from subsequent claimants. The Gurkhas had now decided to measure their strength against the British, considering that their fastnesses in the hills would enable them to wage the war on their own lines. They reoccupied Bhootwal and the other disputed territory, killing the police stationed there and murdering the British official in a barbarous fashion. The Governor-General demanded from the Court at Katmandu, the Gurkha capital, an explanation, but received in return a menacing reply, and war was declared in 1814. Four divisions were ordered to march upon different points of the frontier. The campaign opened with the siege of the petty fortress of Kalunga situated on an isolated hill a few miles to the north-east of Dehra Dun, the monument to the fallen on which spot is so well known to generations of later Dehra residents. The fort was only garrisoned by six hundred men, but we lost more than that number in taking it, including the gallant General Gillespie who led the first unsuccessful assault. General Ochterlony was the only one of the Generals in command who grasped the position and recognised that the disciplined Gurkhas were a very different class of troops to the Indian native troops of the plains, great armies of whom had so often been previously defeated by a mere handful of British soldiers and native auxiliaries. He met the Gurkhas with their own methods, and for the first time in Anglo-Indian warfare erected stockaded posts. Whilst Ochterlony was engaged in capturing Gurkha forts and the fortified posts erected on a lofty and difficult ridge projecting into the Sutlej, the Governor-General was

employed in operations on the side of Rohilkand. He had learned that the inhabitants of Kumaon were held in subjection by the Gurkhas, and he accordingly raised levies from the war like Rohilkandis. One of these regiments marched into the heart of Kumaun and took up a position within sight of Almora, the capital. After severe fighting the whole province was surrendered to the British, the Gurkhas retiring to the east of the Kali River. This victory practically resulted in the end of the war, the Gurkha general, Uilmur Sing, capitulating and resigning all the territory from Kumaun westward to the Sutlej ; the whole hilly tract from Gogra to the Sutlej, a country up to then deemed impenetrable to Europeans, thus being ceded to the British. As a result many of the Gurkhas entered the British service (for they had displayed during the campaign "an unexpected amount of chivalry and exhibited their confidence in the good faith of the British") and were formed into what were termed *Nuseeree* battalions. Kumaun now became a British Province, and the Dun was retained and ultimately annexed to the Saharanpur district. The remaining hill country was restored to the several hill-chiefs from whom it had been wrested by the Gurkhas ; and the whole territory was declared under British protection. The Katmandu Government were at first unwilling to accept the terms of settlement offered by Lord Hastings. They did not wish to have a British resident and military establishment stationed at their capital. Another object of contention was the fertile although very feverish Terai and the fine sâl forests of which, according to a Gurkha saying, "every tree is a mine of gold"—a significant recognition of the value in which these forests were held even at this time. The proposed treaty was therefore rejected, and in 1816 Ochterlony again took the field and won a decisive victory, after which the treaty was signed. As a politic concession, a part of the Terai was given back to the Gurkhas.

This campaign and its result has been glanced at in some detail since as a first result it gave the British thereafter a firm Ally in the Nepal State and some of the finest soldiers in their Native Army ; and as a second, a great tract of very valuable forest which though neglected and abused at first was in the end to form the first notable instance of the great possibilities attending the introduction of a highly scientific forest conservancy into India.

Oudh was still a semi-independent State. At the beginning

of the nineteenth century Sadat Khan was Nawab of Oudh, although his elevation had only come to pass on his signing a treaty with the British which made him a vassal with an English Resident at Lucknow. In 1814 his successor, as a political concession, was proclaimed a sovereign prince, but the treaty remained in force. The provisions were not carried out, however, either by the King or his successors. The country was so ill-governed that, after threats on the part of successive Governor-Generals, Lord Hardinge, at the time Governor-General, visited Lucknow in person in 1847 on the accession of Wajid Ali Shah. The state of the country was so bad that the Governor-General wrote a memorandum suggesting a plan for remedying affairs and giving the King two years to carry it out. In the event of failure to comply Oudh would be annexed.

The records extant on the subject of the forests of Upper India and their administration during the first sixty years or so of our rule in the country are very meagre and furnish little information of real value to the interested enquirer. The one feature which is left in no doubt is that the accessible forests in the northern parts of the country were subject during this period to the same ruthless treatment as those in the south.

As far back as 1825 Dr. Wallich was deputed to the Upper Provinces in order to enquire into and watch over the extensive forests of the empire which were said to be undergoing most wasteful and rapid decay. Captain Satchbull accompanied Wallich. The latter's MS. reports on this visit are not traceable. Evidence proves that long before the close of the period large cities such as Calcutta had to go great distances to procure their timber requirements. In fact, the cities and larger towns were already faced with the timber and fuel question as one of the factors of existence which could no longer be left to chance and the unchecked activities of the timber merchant.

The following extract from Royle's *Prod. Resources of India*, p. 189, with reference to Wallich's reports is of interest: "The reports of Dr. Wallich are particularly valuable respecting the natural forests, both of those within the British territories in India and also those of neighbouring powers. In his visit to the Tarai, or low and moist forest-land skirting the base of the Himalayas, he particularly recommends a vast extent of forest-land in Oude, situated on the east side of the Kowrealia river, as holding out the prospect of very valuable supplies, provided that means are adopted for preventing wanton

destruction and of allowing the young plants to grow up and supply the place of those which are cut down. Among the forests in our own provinces Dr. Wallich advertises particularly to those occupying the Islands of the Gogra, commonly called Chandnee Choke. He represents them as extremely important, and in every way deserving of being preserved for the exclusive use of the Government, and especially of being emancipated from the destructive depredations which are annually committed. The Sissoo and Saul forests of the Deyra Doon are also recommended to be preserved for the use of the service; though from these the facility of transportation is represented as not equal to that from the other quarters previously mentioned. But they are, nevertheless, as important for the stations in the north-west of India, as the forests of Oude and Gokrupore are for those in the south. As considerable deficiencies of timber, at least of those kinds usually employed, such as Saul and Sissoo, besides Bamboos, had been experienced, and as the deficiency every day increased, Dr. Wallich was induced to recommend that the Government should interfere in the management of the forests; for the natives, from their extremely injudicious mode of felling forests, cut and carry away all that are accessible, both young and old plants, without planting anything new in their place, or encouraging the growth of the young seedlings. Another great defect in the native mode of managing timber, is their total neglect of any regular system of seasoning; timber ever being seasoned by them at all, depends upon the proprietor not having been able to sell it."

That these forests were being heavily exploited and yet managed to continue to exist was alluded to by Dr. Falconer in his Report on the Tenasserim teak forests to be reviewed later. Commenting upon the difficulty apparent in obtaining natural regeneration from the great quantities of teak seed which were produced by the trees in these forests, owing to the fact that the seed would not germinate unless the conditions were exactly favourable to germination, Falconer contrasted the sâl seed with the teak in this respect, and incidentally gave a vivid pen picture of the state of the latter forests. "The sâl tree of Hindustan extends in a nearly unbroken belt of forest along the Terai, from the Ganges at Hurdwar to the Brahmaputra, and it is felled to an extent unknown even in the most wasteful parts of the teak forests. Young and old of every scantling, from the sapling of 6 or 8 years to the

full-grown tree, are cut down indiscriminately and the forests are protected by no conservancy rules whatever. Many lacs of the youngest trees are annually removed as 'bullees' to form posts and roofing for native houses : the next larger size, viz. those which are too heavy to be dragged by bullocks, are sawn up longitudinally into 'kurrees,' while the larger trees supply the 'luttas' or logs universally used for the public works and private houses of the Upper Provinces ; yet with such a vast yearly consumption, and drain upon their resources, it is hardly possible to exterminate the sâl forests. The seed has the utmost susceptibility of germination with a vitality so limited in duration that it will not survive many days unplanted. The sâl seed ripens at the commencement of the rains, and after the first shower falls *actually sprouting* from the tree. I have frequently seen in the forests near Hurdwar the radicle of the germ protruding (that is growing) while the fruit was still attached to the parent tree. In consequence young plants come up in the utmost profusion, and very often so thick as to choke each other : they form patches of forest which are literally impenetrable till the woodsman removes them as 'bullees' or 'kurrees.' In this manner the forests are maintained, wherever a tree remains standing to perpetuate the stock."

In the then existing state of ignorance, with reference to the necessity of introducing a proper conservancy of the forests in general throughout the country, this was a dangerous expression of opinion on the possibility of allowing the sâl forests to be ruthlessly exploited without in the end exterminating them. For no forest, sâl or other, can be treated in this fashion without endangering its final total disappearance. Moreover, the fallacy of Falconer's contention that the forests could be maintained is disproved by his statement that saplings of six to eight years old were cut down in large numbers.

It is known that in the early part of last century the population in the fertile plains lands stretching from the foot of the Himalaya down into Oudh was dense, and great clearances of forest for the extension of agriculture had been made long before we commenced to rule India. With the order and safety introduced by British rule the population rapidly increased, and the area under agriculture rapidly extended, invading and sweeping away the forests bordering the areas already occupied. And this invasion had begun to spread to Central India.

The growing difficulty of obtaining timber and fuel was making itself felt. In 1841 Sir Edward Ryan, President of the Agri-Horticultural Society of India, alluded to the great want which was felt for a sufficiency of timber-trees and firewood throughout the Azimghur, Jaunpur, part of the Benares, the Dooab, Rohilkand and Delhi provinces, "now that the manufacturing energies of the people were becoming aroused by the increasing demand that there was for sugar."

In Central India a considerable region of elevated country exists which contains numerous peaks and ranges which in Europe would be designated "mountains." The overwhelming prominence of the great northern range of the Himalaya is so great that this central elevated area is merely designated as hilly, although there are peaks in it rising to 5000 feet. Several of the great rivers of India have their sources in this region and pour their waters into the sea on either side of the peninsula—to the north, the Son, which eventually joins the Ganges; to the east, the Mahanadi, flowing into the Bay of Bengal; to the south, some of the principle feeders of the Godaveri; and to the west, the Nerbuda and the Tapti, taking parallel courses into the Arabian Gulf. This great mass of hills separates Northern India, or Hindustan proper, from the Deccan or country of the south. The more elevated portions of this region are intersected by the plains of Central India. The general elevation of these is about 1000 feet above sea-level. Above these, scattered amongst the peaks, are more elevated plateaux of varying heights with valleys penetrating the hills in all directions. During the period here dealt with the plains were cultivated by Hindus, who had been pressed back from the north during the Mahomedan invasion, and to some extent the Hindus had intermarried with the aborigines occupying this region. But the hills up to the height at which trees would grow and such of the elevated plateaux and valleys, a rough wild country of hills piled on hills in a seemingly chaotic manner, were covered with forest. This great area comprises the Vindhya and Satpura Ranges.

The Máhábhárát and Rámáyan epics speak of all India south of the Jumna as a vast wilderness inhabited by hostile demons and snakes. Religious hermits of the race inhabiting Northern India are described as dwelling in leafy bowers in their midst, whilst heroes and demigods wandered about like knights-errant, protecting the devotees from the hostile acts of the demons. The demons and snakes have been conjectured with some

probability to have been the black aborigines of this region, and the scenes of the epics to portray the gradual advance of the Aryan race and religion into their midst. The wandering rajahs are frequently described as allying themselves in marriage with the daughters of the potent demons, and that this appears to be founded upon truth is to be seen in the descendants of these chiefs who have mixed Hindu Rajput and aboriginal blood in their veins, betraying the former in their fine build, upright carriage, and light complexions, the latter in the thickness of lip and animal type of countenance of the pure aborigine. A few architectural remains tell of Aryan chiefs holding power in parts of the Nerbuda Valley and central plateaux between the fifth and fourteenth centuries, but their true position is unknown, or why they were there. In any event they had ceased to exist as separate entities when the Mahomedans invaded India in the fourteenth century. By then they had probably been absorbed in the surrounding tribes.

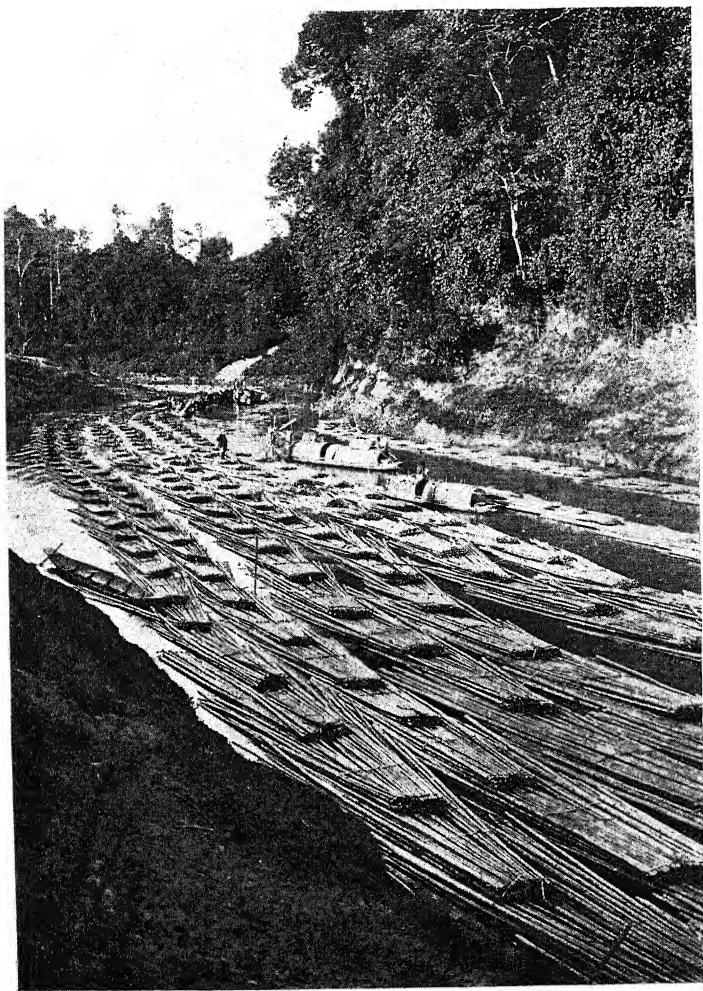
A great part of the country was then called Gondwana, from the tribe of Gonds who chiefly inhabited it. Three considerable principalities existed under chiefs of mixed Hindu and aboriginal blood, and architectural remains and records show that they had attained a considerable degree of stability and development, all the more wonderful when the present conditions of the Gonds, who are little better than rude savages, is taken into account. Doubtless it was the Hindus who were responsible for the civilisation. With the invasion of the Mahomedans into Northern India a great immigration of Rajput clans took place into this region, populated by the aborigines, during the fourteenth and fifteenth centuries. The Mahomedans were then pressing hard on the country between the Ganges and the Nerbuda Rivers then occupied by the Rajputs, and it was doubtless the recoil which sent the Rajputs southwards into the wilds of Central India. Settlements were formed and the industrial race, who had already reclaimed the soil of Northern and Western India, commenced to cultivate the plains and more accessible plateaux. The chief influx of these people appears to have occurred when the great Akbar established his strong Mahomedan Government early in the seventeenth century in the surrounding countries. The impetus given to the development and civilisation of the wilder and unknown regions of India by the wise rule of this greatest of the Eastern Administrators is well known. He put

down lawlessness and strife and introduced peace and the arts, and the civilisation he brought to the country penetrated to some degree into the vast wild regions of Central India. He insisted on his supremacy being acknowledged by the chiefs of the remote regions, but otherwise left them to manage their own affairs. A great development in the resources of the central regions followed. A great highway between Upper India and the Deccan through a gap in the Satpuras was constructed. A great city arose in the Tapti Valley, which became the seat of Government of the southern province of the empire. The rich lands and the great valleys in these territories were reclaimed. The heavy lands of the Nerbuda Valley and those of the Berars were quite beyond the primitive resources of the aborigines. But the Hindu immigrants were well versed in such matters. The Gonds retired before this invasion to the higher plateaux, where their hunting instincts and rude system of raising coarse grains by the method of shifting cultivation, here called *dhya*, could still find scope. The elevated plateaux were next invaded, and their black level soils cultivated with wheat and cotton. But round and above these were hills of rugged unculturable country covered with forests which remained in the possession of the aborigines. The country had reached some degree of prosperity at the time the Mahomedan power began to decline in the latter part of the eighteenth century, the Maratha power coming to supplant it. The hordes from the Deccan soon began to overrun the Gond country, and the three principalities were broken up and disappeared. The Maratha Confederacy at length fell out over the division of their plunder, and matters grew worse in the hilly regions. The hill-chiefs from having been the despoiled became the despoilers, and appalling anarchy reigned, culminating with the organisation known as the Pindari bands, whose hand was against everyone. This state of affairs lasted for nearly twenty years, and large areas of reclaimed country went out of cultivation and became covered with jungle. In 1818 we at length broke the power of the Marathas and stamped out the Pindari bands. But we found that as the result of twenty-five years of interneccine warfare the fair territories of this region were ruined. Saugor and Nerbuda were the portions of the area which came under British administration at this period, the territory of Nagpur only coming to us in 1854 on the failure of heirs to the Rajah.

During the warfare which had raged in the Central Indian

Region the aborigines had earned the reputation of being savage and intractable. This reputation was merely the outcome of the lawless period of the quarter of a century which preceded British rule. They proved themselves a remarkably peaceful and law-abiding people under British rule, only asking to be allowed to roam and hunt in their jungles undisturbed ; practically no outburst of any importance had taken place amongst them after the British assumed sway over the country. The chiefs were early secured in their feudatory position, with the full proprietorship of such territories, both in the hills and in the plains, as they could establish a title to ; and for many years the management of their internal affairs was left in their hands. In fact, we followed the policy of the great Akbar. And for very much the same reason. Our early administrators had their hands more than full with the work of restoring prosperity to the destroyed areas in the open country ; they had no time to spare for the aborigines in the forest-covered hills or their affairs. So little was known about them or the country they occupied that as late as the 'fifties of the last century the Gonds were described as a people going naked, or clothed in leaves, living in trees and practising cannibalism. Mr. C. Grant, C.S., in the earliest issue of the *Central Province's Gazetteer*, wrote : "So lately as 1853, when the great trigonometrical survey of India had been at work for half a century, and the more detailed surveys for some thirty years, Sir Erskine Perry, addressing the Bombay branch of the Royal Asiatic Society, wrote, 'At present the Gondwana highlands and jungles comprise such a large tract of unexplored country that they form quite an oasis in our maps.' Captain Blunt's interesting journey in 1795, from Benares to Rajamandri, gives us almost all the information we possess of many parts of the interior."

At the close of the period here reviewed "unexplored" was written across vast tracts in our best maps ; and though lying at our very doors unexplored they were. The civil officers of those days had no time to penetrate into their wild recesses and perhaps little inclination. For the accounts of these regions which they obtained from their Hindu or Mahomedan subordinates, inhabitants of the plains country were not calculated to stimulate their curiosity, save in rare instances, to penetrate their fastnesses. For the plainsmen of India regarded the jungles with horror and terror as the abode of demons, wild men and wild beasts, and fever accom-



BAMBOO RAFTS OF MULI BAMBOO, KASSALONG RIVER, CHITTAGONG HILL
TRACTS

R. S. Pearson in "Indian Forester," Vol. XLVI



panied by discomforts in travelling not to be faced if they could be avoided.

As will be shown in a subsequent chapter it was left to the early and energetic activities of the newly appointed Forest Officers of the infant Department to first explore and describe the beauties and value of this fascinating region.

Towards the end of the period here dealt with difficulties were being experienced in the Punjab in obtaining timber for the operations of the Public Works Department, and the enquiries instituted were to lead to the development of the beginnings of a policy of conservation of the forests in the plains and hills. But so far unchecked exploitation of accessible areas had been in force, with its accompaniment of extensive firing of forest areas and unrestricted grazing.

The same practices continued in the forests of the North-Western Provinces and Bengal. In the latter province owing to the absence of wood fuel in the plains cow dung had long been used as fuel in lieu of being utilised as manure. Allusion has already been made to the fact that Wallich in his report on the Tenasserim forests in 1827 stated that "even the vast sal forests of Hindustan have begun of late to fail." The Assam Forests were practically unknown at the period, although the Bengal Khedda Department, whose headquarters were at Dacca, had carried on the former native Government's practice of trapping elephants in the Tipperah Hills and Chittagong Hill Tracts.

A word must be said, however, on the interesting plantations on the Western and Eastern Jumna Canals commenced as far back as 1820-21 and 1830-31 respectively. Captain R. Baird Smith, Bengal Engineers, wrote as follows on these plantations in the *Calcutta Review*, No. 23 :—

"The formation of plantations early occupied the attention of the British Superintendents of the Western Jumna Canal. Something was done by Captains Blane and Tickel; but it was left to Colonel Colvin to proceed systematically in this useful duty. An allowance of 2000 rupees, afterwards increased to 3000 rupees per annum, was allotted to the plantations, and they have been spread over all parts of the canals to which water could reach. The trees planted are chiefly the Sissu, the Toon, the Kikur, the Cirrus, the Saul and the Teak, all furnishing woods of value for economical purposes. The revenue derived from the plantations has more than covered all expenditure upon them; and their ultimate value will be

very considerable. The details of the kind, number and estimated present value of the trees on the 30th April, 1847, are as follows : Kikur (*Vachallia farnesiana*), 91,520 ; Bamboo (*Bambusa*, var. sp.), 4,420 ; Jamun (*Eugenia Jambos*), 6,914 ; Kutchna (*Bauhinia*), 1,771 ; Mango (*Mangifera indica*), 1,060 ; Mulberry (*Morus*, var. sp.), 18,746 ; Nim (*Melia Azaderach*), 7,126 ; Cirrus (*Acacia Serissa*), 13,966 ; Sissu (*Dalbergia Sissoo*), 184,252 ; Toon (*Cedrela toona*), 35,487 ; Sundry, 9,990. Total: 375,252.

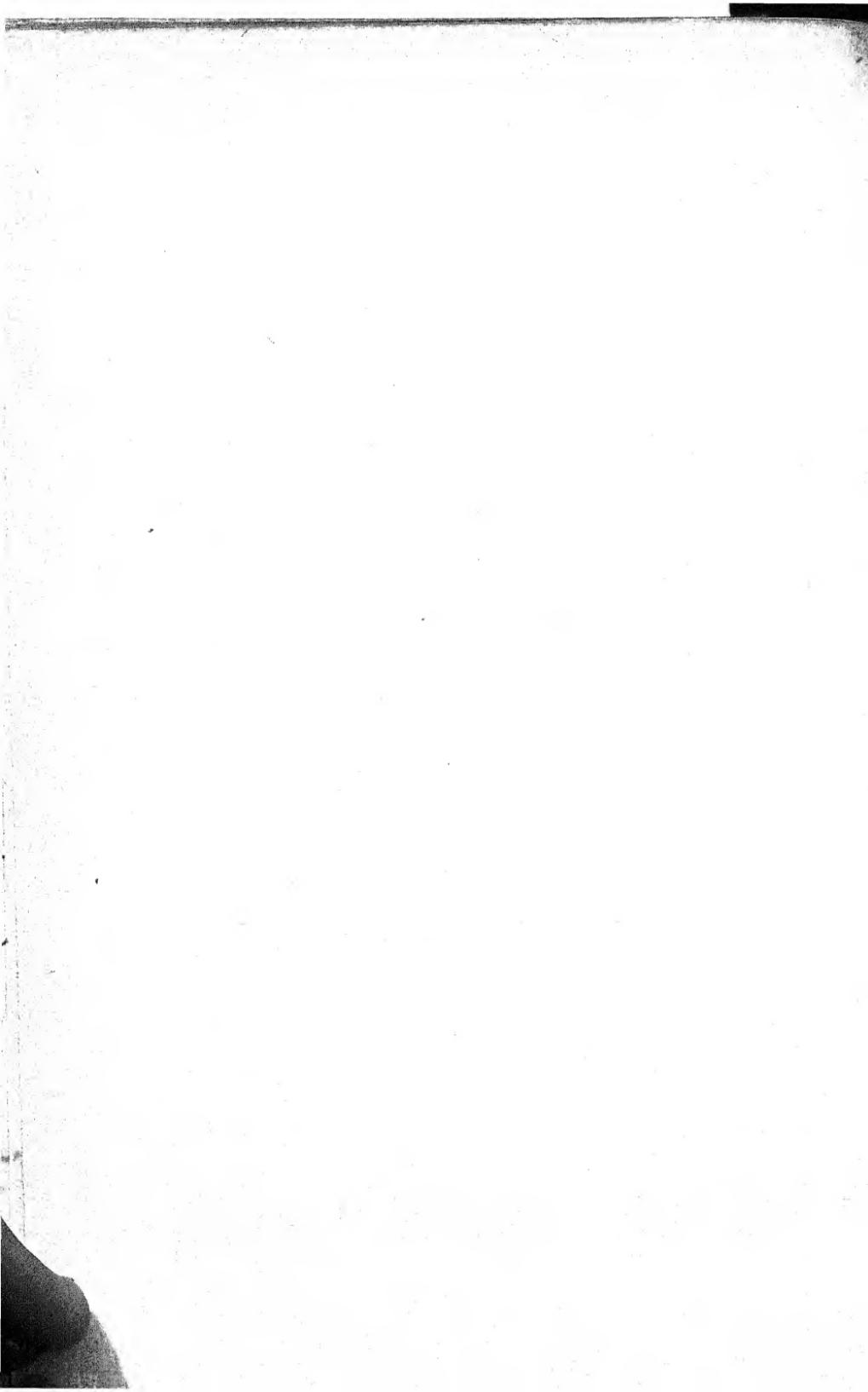
"The estimated value of these trees is 5,66,998 rupees, and the total expenditure by Government up to the present time amounts to only 27,363 rupees, or about one-fourth of the revenue derived from the plantations." The revenue between 1820-21 and 1846-47 amounted to rupees 90,822.

"The plantations on the Eastern Jumna Canal were commenced simultaneously with the canal itself, and have been extended systematically from that period to the present time. The kinds and numbers of the trees in the canal plantations are as follows : Sissu, 209,870 ; Cirrus, 8,058 ; Kikur, 28,501 ; Nim, 6,799 ; Mulberry, 9,306 ; Bamboos, 1,906 ; Lullow, 2,774 ; Teak, 1,158 ; Toon, 15,967 ; Sundry, 7,416. Total: 291,754.

"The estimated value of the plantations is rupees 1,46,793 ; and the total expense incurred by Government in their formation up to April, 1847, is rupees 22,142, which sum, as will be seen, has been nearly covered by the sale of wood, etc., from the banks." The revenue obtained between 1830-31 and 1846-47 amounted to rupees 21,977.

PART III

THE FIRST BEGINNINGS OF FOREST CONSERVANCY
IN INDIA, 1850-1857



CHAPTER XI

THE INITIAL STAGES IN THE DEVELOPMENT OF A FOREST POLICY, 1850-1857—THE ANNEXATION OF THE PUNJAB, OUDH AND THE PEGU PROVINCE, BURMA

THE years between 1850-7 witnessed the first beginnings of forest conservancy in Southern India, and it has therefore been deemed advisable to deal with this period separately, detailing briefly the departures and progress made in Madras, Bombay, Burma and elsewhere in India, a progress which was the direct outcome of the mistakes, now becoming obvious, made in the past.

It has been shown that it had been repeatedly urged during the previous twenty years both in Madras and Bombay that scientific advice in the management of the forests had become an urgent necessity if the forests were to be preserved from complete destruction. In 1847 the Bombay Government had appointed Dr. Gibson Conservator of Forests in that Presidency. Madras did not follow the example till nine years later (1856), when Dr. Cleghorn was appointed Conservator of Forests in that Presidency. Cleghorn, as has been already shown, had for some years interested himself in the forestry question, and had submitted a report on the Conservancy of the Forests to Government in 1856.

These two appointments may be said to have been the first real steps taken in these Presidencies towards the initiation of the beginning of a continuity in the conservancy and management of the forests.

In Burma the history of the administration of the forests underwent a marked change before the end of the period here dealt with. Dr. Falconer, who had been deputed to visit and report on the Tenasserim Forests in 1849, submitted the Report of his investigations in January, 1851. This Report confirmed the general opinion that the licence system which

had been in force since 1829 had almost ruined the greater bulk of the forests. The Commissioner, Mr. Colvin, had organised, after Captain Latter's departure, a small forestry department which endeavoured to work the Rules in force, but with scant success. The grantees still carried out their operations on the old lines, and this state of affairs was in existence when Dr. Brandis took over charge of the Tenasserim and Martaban Forests in 1857.

In 1852 the Province of Pegu was annexed. For nearly a hundred years teak timber had been one of the chief exports from Rangoon, the forests having been treated as Royal property by the Alompra dynasty. With this precedent to guide them the Government soon after the annexation proclaimed all the forests to be Government property, and Dr. McClelland was appointed Superintendent of Forests. The rights of the new Government to the ownership of the forest property were not disputed, but the proclamation did not put an end to the wasteful exploitation by timber merchants, the increased demand for teak timber resulting in the same methods of intensified fellings which had succeeded our advent in Madras and Tenasserim. The new Superintendent spent some months in travelling through and examining the forests, the results of his observations being compiled in a report submitted to Government in 1854. In this report he suggested certain restrictions to the unchecked exploitation by private parties.

It was this report which resulted in the famous Memorandum of the Government of India, dated 3rd August, 1855, which may well be termed the Charter of the Indian Forests, in which Lord Dalhousie, the Governor-General, laid down for the first time the outline of a permanent policy for forest conservancy. This Memorandum will be dealt with in full later on. It should be known to every Indian Forester and those who have an interest in the great forest estate in India. Briefly summarised the Governor-General enunciated the following forest policy :—

Lord Dalhousie pointed out that on the annexation of the Province of Pegu it was laid down as the ruling principle in the management of the forests that the teak timber should be retained as State property. That in consequence all killed (by ringing or girdling) standing trees and felled trees still lying in the forests, as also standing green trees, were public property to which individuals had no right or claim. That the

two former categories should be disposed of in such a manner that the full price of the timber should accrue to the Government and not go to swell the profits of timber traders. That in the case of the standing green trees which had reached exploitable size they should be removed in conformance with the future proper maintenance of the forests and not be exploited for the benefit of timber merchants and to the ruin of the forests, as had been the case in the Tenasserim Forests.

Lord Dalhousie's pronouncement was the act of a far-sighted statesman and proved him to be a man far ahead of his times. It marked the first real step towards the scientific conservancy of the forests, and fortunately for India the man was found possessing both the requisite scientific forestry knowledge, firmness of character and the equally necessary tact to carry through the policy determined upon in face of the most strenuous opposition. Dr. McClelland, as will be shown in a subsequent chapter, laid down the broad preliminary lines of forest management in Pegu during the few years he held the post of Superintendent. It was left for his successor, a trained Forest Officer, to work on these lines and amplify them.

Dr. McClelland's successor was the late Sir Dietrich Brandis, K.C.I.E., who has been aptly named the "Father of Indian Forestry," a position which he may be said to share with Dr. Cleghorn. Mr. Brandis (as he then was) was appointed Superintendent of Forests in Pegu in January, 1856, and in the following year the Tenasserim and Martaban Forests were added to his charge. It soon became evident that at last a master-hand had grasped the helm of the almost derelict ship of Indian Forest Conservancy and a new era commenced, a description of which belongs to the next period into which this review has been divided.

There is no wish or intention to belittle the work and struggles of the men who up to this date had grappled with the forestry problem. They accomplished much arduous and valuable spade work in the face of official apathy or active opposition ; through years of disheartening toil they laid a foundation on which to build. But none of them had previously received a scientific forestry training. Brandis was a fully qualified, scientifically trained Forester, a German who had received his training in Germany, at the time one of the finest training grounds in the world, its only rival being France. And with this training he possessed the attributes which go to make the great scientific pioneer.

In Upper India but little progress in forest conservation was made. In the Punjab, which had been recently annexed, the provision of timber supplies came under consideration in connection with the requirements for Public Works.

In 1845 the Sikhs ruled over the Punjab and the hill country between the rivers Beas and Indus. War broke out between the British and the Sikhs in the winter of 1845-6, and as a result of the decisive battle of Sobraon (February 10th, 1846) a treaty was made between Lord Hardinge, the Viceroy, and the State of Lahore, under which there was ceded to the East India Company in perpetual sovereignty as equivalent for one crore of rupees (£1,000,000) of indemnity, the hill countries between the rivers Beas and Indus. This tract included Kashmir. Rajah Gulab Singh ruled over Jummoo and neighbouring areas. In return for his non-co-operation with the Sikhs and the help he gave in the peace settlement the British ceded to him Kashmir under a separate treaty, conferring upon him the title, or recognising him under the title, of Maharaja. The treaty gave to Gulab Singh "all the hilly or mountainous country situated to the eastward of the River Indus and westward of the Ravi," the Maharaja agreeing to pay to the British Government the sum of 75 lakhs of rupees (about £750,000). It was in this way that the British gave up the fair vale of Kasmir. The object of the Governor-General was to lessen the strength of the Sikhs by establishing on their flank a power independent of them and inclined to the British. For the British were not proposing to annex the Punjab. They arranged for the government of the Punjab by its own native rulers—by the young Maharaja Dhuleep Singh and the Council of Ministers. The British hoped in this way to set up a stable Government at Lahore. But this was not to be. In a couple of years the Sikhs again gathered together an army and attacked the British, being finally defeated at the battle of Goojerat (February 21st, 1849). On March 26th, 1849, the Punjab was annexed and became a British Province.

As has been said forest operations came under consideration soon after the annexation and during the period here considered owing to the developments taking place in the construction of buildings and communications in the Punjab, where a dearth of the timber required was making itself felt. Captain Longden was deputed by Lord Dalhousie to carefully explore and report on the forests of the Western Himalayan Range, from Chamba eastwards to the north of Simla,

a duty which he carried out in 1852-3. As an outcome of his explorations of the forests in the valleys of the Sutlej, Beas, Ravi and Chenab, a Timber Agency was established on the Chenab and a depot formed near Sealkote from which to supply the principal Public Works of the Punjab with timber.

The Kashmir State also gave some considerable attention to the timber supply question and commenced cutting and exporting timber to the Punjab markets.

Rules were drawn up and put into force for the Kangra District, the Rawal Pindi District and for Hazara; the question of providing steam fuel on the Upper Indus also came under consideration.

At Simla the fuel question of that station and the others in these hills had already become acute, and Dr. Falconer wrote a Memorandum on the question of making adequate provision for these supplies.

The Sind Forests were already under a forest staff, and the regulation of their working was for this period already on fairly efficient lines.

Elsewhere in Upper India forest conservation had received little attention. In the North-West Provinces no forest Rules were in force and no conservation of the forests had been attempted, although the difficulty of procuring timber had been making itself felt. The administration of the forests in these Provinces was reported by the Government of India to "have been a melancholy failure." A Superintendent was appointed in 1854 to the forests in the Dehra Dun and the west of Rohilkand, "the result of whose bad management was the completion of the ruin of almost all the forests that still contained good-sized trees."

In Oudh we have seen (p. 194) that the King Wajid Ali Khan was given by Lord Hardinge in 1847 two years in which to redress the gross abuses existing in the government of the country. In 1849 Lord Dalhousie, then Governor-General, called for a report from Colonel Sleeman, the Resident. This report was adverse. Matters were in a worse state, and both nobles and people were crying out against the oppression of the King, whose chosen favourites were two Eunuchs, two fiddlers, two poetasters, the Minister and his creatures. Repeated warnings were sent to the King, and in 1855 it was determined to take action. Sleeman having fallen sick, Colonel (afterwards Sir James) Outram, the Bayard of India, was sent up as Resident. His report confirmed Sleeman's as to

the appalling state of the country, comprising a population of some 5,000,000. In 1856 Outram was entrusted by Lord Dalhousie with the execution of the orders of the Court of Directors to depose the King. Oudh was annexed and an ordered British Administration set up.

In Bengal and Assam no steps had been taken towards the conservation of the forests, those accessible being still worked in the wasteful fashion which had been in force for centuries. Moreover, the larger and more valuable, but inaccessible, of the forest tracts in these Provinces were unexplored and unknown.

A consideration of the first commencement in forest conservation in the North-West Provinces, Oudh, Bengal and Assam will therefore be deferred to the next part of this history (1858-1864).

Allusion has been made in a previous chapter to the effect which the great devastation of the forests throughout the centuries following the Aryan invasion of India had upon the climate, and the consequent decrease in moisture which followed in parts of the country with a corresponding rise in temperature. The effect on the climate through this destruction was slow, imperceptible probably at any one period over any large area, but cumulative during the long period of nearly four thousand years. That in the time when India was covered with forests the climate was a more equable one is indisputable. Fa-Hian, the great Chinese traveller in India in the fourth century A.D., says, in describing the country, that its temperature was neither cold nor hot. No traveller could so describe it nowadays. Nor would any Englishman have so described it a century ago.

The question as to the action of forests on rainfall has been a matter of dispute amongst foresters, agriculturists, engineers and others for a long period past—probably dating from the times when scientific forest conservancy was first introduced. Experiments of a more extended nature over considerable regions will be required to settle the matter with axiomatic definiteness. But in India this has not been in the past and is not at the present time the point in vital issue. The question of real importance for the country was to determine in how far the destruction of forests in catchment areas and on the sides of hills and mountains in the drier parts of the country affected, in the first place, the level of the water in the big rivers, a matter of the first importance when these

rivers are utilised for irrigation or power works ; secondly, the decrease in the local water supplies and in the local precipitations, of so great importance to the cultivator ; and thirdly, erosion and avalanches with the destruction they cause in the fertile valleys beneath. That these aspects of the effect of forests on the well-being of India and its inhabitants are of primary importance is proved by the fact that the discussions on the matter, for and against, supported by evidence and what is being recognised as uncontrovertible proof, runs through the whole of the century which has elapsed since the interest of the British was first aroused to the value of the Indian forests as a possible asset to the country and its inhabitants.

In France and Germany special laws for the protection and extension of the forests and the protection of agricultural lands by means of the forest had long been in operation and similar laws existed in the Italian States. So far back as 1475 the subject attracted the attention of the famous Venetian Council of X., by which a law was passed on the 7th January of that year, regulating in great detail the clearance of the forests on *terra firma*. The mountain forests especially were protected by judicious regulations, which were renewed from time to time down to the very year of the extinction of the old republics. Tuscany and the Pontifical Governments were equally provident.

It will be of interest to deal briefly with the opinions expressed in India during the period dealt with in this part.

Allusion has already been made to the fact that the area of forest in the early days of the colonisation of India was very much greater than existed on our arrival in the country. It has also been mentioned that numerous instances can be enumerated of tracts once under cultivation having, with the withdrawal of man's active interference, become reafforested by Nature's own efforts. This would seem to prove that a proportion of the country which was clothed with forest in pre-Vedic ages, such as the great Khandava Forest and other extensive forest tracts which were destroyed by man, could become reafforested under favourable circumstances in a similar fashion. History has shown even in Europe, in Spain, Italy, Sicily, Greece and Macedonia, for instance, that the destruction of large areas of forests has resulted in a great deterioration of climate over considerable tracts, followed by the loss of moisture and sterilisation of the land. In India

the same thing has resulted, as is well evidenced in the intermediate and dry zones in the Deccan and in the north-west of the country. The great factor in this connection lies in the presence of trees on the area. In the case of barren slopes the rain rushes rapidly down them, but a fraction percolating into the soil, reaches the stream beds and is carried rapidly away, giving rise to spates and perhaps serious floods. A hot sun bursting out on to the slope after the rainstorm quickly sucks up the thin layer of moisture covering it. If the area is under trees a portion of the rain falling on the crowns of the trees drips slowly down on to the layer of humus (leaf mould) beneath and sinks into it. The larger portion falls perhaps direct on to the forest floor, where it is slowly absorbed in the soft covering which takes it up like a sponge. The water then percolates slowly downwards, filling up springs and underground reservoirs and reaches in a retarded manner the streams. The flow in the latter is consequently more even and regulated, as is the amount of water which eventually reaches the rivers. The latter can therefore be more depended on as to the annual even amounts to be found in them when it is wished to utilise them for irrigation purposes or for water-power. Trees, by the transpiration from their leaves, surround themselves by an atmosphere which is constantly cold and moist. They also protect the soil from the direct action of the sun, and thus prevent evaporation of the water furnished by the rains.

This is one of the now recognised functions of the forest with reference to rainfall. It was appreciated by the very few at the period treated of here. The other factor is connected with local precipitations. The roots of forest trees take in moisture which during the period of vegetation is exhaled by the leaves, which thus give to the atmosphere a far larger amount of moisture than would be evaporated from the bare ground, and the amount of moisture thus given off is given out gradually and thus spread over a longer period. The presence of a considerable area of forest in a locality thus assists in forming local rain clouds which produce a rainfall of very considerable importance to the locality, but which is quite independent of the falls due to the geographical position of the area, its elevation, configuration of the ground, prevailing wind currents and rain-bearing currents. In India, for instance, the forests exert no influence on the monsoons, either in the date of their approach or in the intensity of the rainfall they yield. The rain of the monsoons is drawn from

the ocean, and the direction and strength of the winds is governed by far greater causes than areas of forests could exert. But a considerable tract of forests in a locality in India has an undoubted effect on local precipitations. In Assam, for instance, which is a broad, isolated, well-wooded valley, rain clouds form in the winter and rain falls at a season when no rain-bearing air currents enter it from the sea. The clouds arising at this season are home-born, and are to some extent due to re-evaporation from the great forest tract still existing in these regions. Assam forms an excellent example, but the same laws hold good for any locality. This being so, it is possible to understand the great drying up which has taken place during the past centuries over considerable areas in India as a result of the excessive destruction of the forests. It is also equally possible that the proper appreciation of this fact becomes a point of vital importance when the question of the area of forest which should be maintained in the different provinces of the country is under consideration; not solely from the commercial point of view, but from that of the well-being of the population and their agrarian pursuits.

As well-known examples of the evil effects following upon ill-considered disafforestation the following instances are applicable :—

The slopes on the west coast of the Bombay Presidency were once, even in the early days of British occupation, covered with magnificent, valuable and extensive teak forests. These have long since been cut out. The denudation of the Deccan Highlands and the Eastern Ghâts has resulted in the gradual silting up of the rivers. When the Dutch, French and English first built settlements on the Coromandel Coast, it was possible to take ships up the Godaveri and Kistna. The English port of Narasapur and the French one of Yanaon, both on the Godaveri, were once the chief ports of this coast. They can now only be reached at high tide by small native, shallow-draughted craft. At Masulipatam the Dutch ships used to anchor close up to the port, whereas at the present day even small native vessels have to anchor five miles out in the roads. A century ago the town and port of Gangam were places of considerable importance on this coast. Small sea-going vessels used to cross the bar of the river and lie at anchor opposite the fort. An inspection nowadays will show that there is scarcely two feet of water at this spot in the dry season. The writer has shot wildfowl in marshes in the vicinity

in places where in olden days vessels rode at anchor. All these examples are on the east coast of Madras, the silting up of the rivers and the decrease in the water supply being due to the destruction of the forests on the Eastern Ghâts.

Dr. Gibson enumerates in one of his first Reports on the forestry question in that Presidency a list of the rivers and creeks on the Malabar coast where on our arrival in those parts ships used to ride at anchor, all the creeks having silted up within the memory of men then living.

The illustrations given are perhaps sufficient to depict the position of affairs and the opinions held on this matter in the earlier portion of our rule in India. More detailed investigations were carried out at a later stage, as will be described.

On the initiation of Dr. Cleghorn at the meeting of the British Association in Edinburgh in 1850 a Committee was appointed to consider the destruction of Tropical Forests in India.

The summary of the position as thus envisaged, given in the Report of the Committee in 1851,¹ is of interest :—

" The question as between the maintenance and removal of forests appears to us to be a question of compensation. Whenever the progress of population requires that every portion of the soil be made to yield its quota of human food, then the destruction of forests is to be desired, and the disadvantages to which want of wood for social and general purposes may lead, must be compensated for, as they doubtless will be, by the ingenuity which is borne of necessity. But there are localities in nearly all countries to which the tide of population can never flow, but where the forest can flourish, and where it ought to be maintained. In tropical countries the preservation of the springs which feed the rivers, on which the fertility of the land and the prosperity of the people are so essentially dependent, is of the greatest importance. These springs arise in the mountain regions where forests prevail, and it is to such regions that a protective agency should be extended, for there can be but little doubt that the entire removal of wood leads to the diminution of water. In a single sentence, we would say that where human exigencies, whether for subsistence or for health, require the destruction of forests,

¹ " To consider the probable effects in an Economical and Physical point of view of the Destruction of Tropical Forests," by Dr. H. Cleghorn, Professor Forbes Royle, Captain H. Baird Smith, Bengal Engineers, and Captain R. Strachey, Bengal Engineers. British Association Report, 1851.

let them be destroyed ; but where neither life nor health is concerned, then let a wise system of preservation be introduced and acted upon."

It is doubtful whether during this early period the various Governments of the Southern Presidencies appreciated to any extent the effect upon the rivers, and as a result of denudation and erosion on hill-sides covering up arable land in the valleys below, which the unchecked destruction of forests in the areas by timber merchants and those practising the shifting cultivation, must eventually have on the country. In the mass of correspondence and reports which were produced on this subject, even at that early date, there is little to indicate that any anxiety was felt in this connection. The main anxiety during the greater part of this period, up, in fact, to Lord Dalhousie's famous Memorandum of 1855, was on the score of any failure in the teak wood supplies, and the destruction to the forests proceeded practically unchecked during the greater part of the period, being accelerated in some localities by the large demands for teak on the part of the Government.

The following vivid little pen picture of India and its forests as they existed in 1850 is from the British Association's Report of 1851 : " British India is so extensive an empire, so diversified in soil and climate, as well as in natural and agricultural products, that it is impossible to predicate anything respecting it generally ; that which is descriptive of one part is not necessarily applicable to another. Thus some parts are covered with primeval forests, as the mountainous coasts of Canara and Malabar, the country surrounding the Neilgherries, the Tenasserim Provinces, much of Central India, the base of the Himalayan Mountains from Assam up to the banks of the Ganges, as it issues from the hills, and beyond it ; while other parts are not only bare of trees, but even of vegetation of any kind, as the deserts which run parallel with the Indus, and stretch more or less into the interior of India. The North-Western Provinces, as well as many parts of the Peninsula of India, are generally bare of timber trees, as also are the highly cultivated Southern Provinces of Bengal. But in most parts of India clumps of trees may be seen by the traveller in every direction in which he can look. This is owing to the Indian practice of embowering every village in a clump or tope of trees, generally of the mango, but frequently the ber, peepul and tamarind, etc., are found, some yielding

fruits, others grateful for their shade, and some yielding fodder for elephants and camels. In the neighbourhood of every village also may be seen tracts of jungle, more or less extensive, which by some are accounted so much waste land. They are often composed of long grass or low shrubs, as the *Dhák* and wild Jujube, with a few trees intermixed as the *babul* and *siris*. These tracts, though disfiguring the rich appearance of a cultivated country, are far from useless, as they form the only pastures which the natives possess for their cattle, as well as their whole source of supply of firewood and whatever timber may be required for the building of their huts or the making of their agricultural implements.

" From the number and extent of the forests and jungles of India, it might be inferred that timber was abundant in all parts, not only for home consumption but that a supply might be obtained for foreign commerce : this is far from being the case. Though forest lands are extensive, their contents in accessible situations are not of a nature or sufficiently abundant to supply even the ordinary demands. In India, as in other long-inhabited and early civilised countries, the parts best adapted for agricultural purposes have long been cleared of jungle. The forests lying nearest to the inhabited tracts were first stripped of their timber, and as no precautions have been taken to replace the old trees a gradual diminution has been observed in the supply of timber, which has consequently increased in price (as may be seen in the Government contracts for building and the commissariat outlay for firewood) not solely from actual deficiency, but because timber is only obtainable from less accessible situations, with considerable increase of labour and expense.

" As the principal cities where the greatest demand for timber exists are in the centre of cultivated tracts, so are they necessarily remote from the forests from which they require wood, either for the construction of houses and materials for shipbuilding or other purposes. Hence a commerce in timber has long been established in India. Calcutta and the cities situated on the Ganges are supplied with timber grown in the forests which skirt the foot of the Himalayan Mountains, from Assam to the banks of the Jumna. These supplies are floated on rafts down the numerous feeders of the Ganges, which forms the great artery of the plains of India. But this is not sufficient for the consumption of Calcutta, as considerable quantities are imported from the Burman Empire. In the same

way there is an insufficient supply for the Madras Presidency, which is made up by importing timber from Ceylon."

" Looking to the extent of India, and reading of interminable jungles, it may seem a work of supererogation to talk of the deficiency of timber or of the necessity of protecting its forests. Timber to be valuable must be of the proper kind, of the proper age, and at proper distances, that is, in accessible situations. As might have been expected, from continual drains being made on these forests, without adequate measures having been adopted to keep up the supply, a continued and increasing deficiency has been experienced in all parts of India, which has frequently attracted the attention of the Indian and Home Governments, so that in the Bombay Presidency numerous reports have been made on the state of the teak forests, and measures adopted for their improvement, without as yet much benefit."

The following is the summary of the conclusions of the Committee who drew up the British Association's Report of 1851:—

" (1) That over large portions of the Indian Empire there is at present an almost uncontrolled destruction of the indigenous forests in progress, from the careless habits of the native population.

" (2) That in Malabar, Tenasserim and Sind, where supervision is exercised, considerable improvement has already taken place.

" (3) That these improvements may be extended by a rigid enforcement of the forest regulations and the enactment of additional provisions of the following character, viz. careful maintenance of the forests by the plantation of seedlings in place of mature trees removed, nurseries being established in the immediate neighbourhood and prohibition of cutting until trees are well grown with rare and special exceptions for peculiar purposes. In cases of trees yielding gums, resins, or other valuable products, that greater care be taken in tapping or notching the trees, most serious danger at present resulting from neglect in this operation.

" (4) That especial attention should be given to the preservation and maintenance of the forests occupying tracts unsuited for culture, whether by reason of altitude or peculiarities of physical structure.

"(5) That in a country to which the maintenance of its water supplies is of such extreme importance, the indiscriminate clearance of forests around the localities whence these supplies are derived is greatly to be deprecated.

"(6) That as much local ignorance prevails as to the number and nature of valuable forest products, measures should be taken to supply, through the officers in charge, information calculated to diminish such ignorance.

"(7) That, as much information which may be of practical utility is contained in the Manuscript Reports and Proceedings of the late 'Plantation Committee,' amounting to over 1070 pages of MSS., it is desirable that the same should, if practicable, be abstracted and given to the public." The Plantation Committee originated under the administration of the Marquis of Hastings, but the above recommendation was unfortunately never given effect to.

The above forms a good summary of the position of the Forestry question at the period here dealt with.

CHAPTER XII

THE INITIAL START IN FOREST CONSERVANCY IN THE MADRAS AND BOMBAY, 1850-1857

IT has been shown that Bombay took the first step in appointing an administrative Conservator of Forests, that is a Conservator who should not be merely a commercial timber exploiter, but whose chief duties should be in connection with the superintendence and amelioration of the forests themselves. In 1847 Dr. Gibson had been appointed to this post, a post he had informally filled for several years previously as Interim Conservator, in addition to his own appointment as Superintendent of the Botanical Gardens.

We have also seen that the Madras Government took advantage of the existence of the Bombay Conservatorship to obtain advice from Gibson with the object of straightening out some of the tangle into which their own forest administration had become involved during the past half century.

Gibson's appointment in Bombay and the work he accomplished there was not without its effect on the Madras Government, and in 1856 they took a similar step and appointed Dr. Cleghorn as Conservator in that Presidency.

The work of the period under review was essentially of a transitory nature. The system of working the forests was gradually passing over from the hand-to-mouth policy pursued during half a century. This policy had as its primary objects the satisfying, or attempt to satisfy, the complaints and demands of the lessees of the forests and those whose claims to private ownership had been assumed without enquiry to be legally sound. These persons, owing to the mistaken policy introduced in the early days for securing the requirements of timber by Government departments, had been allowed to obtain a definite hold over large areas of forest. The secondary object was to assure to Government the provision of its full timber demands for the dockyards, gun-carriage factories,

public works and so forth. The new ideas, which had come to be seen as essential, were concerned with the correct management of the forests not solely with a view to assuring future timber supplies. It was slowly being realised that unrestricted *Kumri* cultivation was harmful, alike in the great waste of timber thereby engendered and also, in many parts, to the direct interests of the ryots owing to the ensuing decrease in the water supplies and to resultant erosion covering up valuable fertile lands. The same effects resulted from the areas cleared for coffee plantations, though this latter question scarcely advanced beyond an academic discussion during the period. What had been grasped by now was the great decrease in accessible timber forests; the fact that vast areas of fine forests had been cleared off in the neighbourhood of the floatable streams; and that the destruction of the remaining accessible forest was being hastened by the commencement made in railway construction, although this new method of communication had not made very great progress during the period.

The Conservators drew up some very valuable and instructive reports as a result of personal investigations carried out during tours made throughout the charges to which they had been appointed. These to a great extent recapitulated matters which have been already dealt with in previous chapters. But a certain amount of interesting material regarding the first beginnings of regular conservancy merits notice.

Bombay Presidency. Gibson's work in Bombay was of a varied character. He undertook several tours through the forests in parts of the Presidency and drew up some valuable reports on these tours. He paid particular attention to the destruction caused to the forests by the *Kumri* or shifting cultivation, and pointed out the evil effects resulting from this primitive form of agriculture both in the drying up of springs and streams and in the silting up of rivers and creeks, thereby destroying natural harbours which had existed in the lower parts of these rivers and on the coast.

It was due to Gibson's untiring crusade against the *Kumri* cultivation that by the end of the period under review it had come to be greatly restricted in the Bombay Presidency. In a Memorandum dated 23rd May, 1860, written by Mr. J. D. Bourdillon, Secretary to the Government of Madras, on a Report on this subject by Cleghorn, the Secretary notes "that

in Mysore the practice of *Kumri* cultivation has been entirely abolished, and that in the jungle districts of Bombay it has been so very nearly." Gibson, following Conolly's example in Malabar, also devoted much attention to raising young teak plants to form plantations.

Allusion has been made in the previous period (p. 122) to the levying of fees on the felling of jungle timber by reimposing the levies formerly collected for Government by the Land and Customs Department along with the transit dues. Government sanctioned this proposal in 1851.

The system adopted with regard to the collection of these fees was, generally speaking, to farm the right to collect them, except in lesser divisions and in particular localities where the collections were made under direct management by an establishment of carcoons (clerks) and peons, who were posted at the various points through which the timber and other forest produce had to pass. These establishments were, until 1854, entertained through the medium of the kamavisdars of the several collectorates in which the fees were levied, and were paid out of these fees as collected, the balance only being carried to the public account. But after 1854 the payment of these fee-collecting establishments, wherever employed, was vested in the Conservator, the entire proceeds of the fees as received being remitted to the credit of the Forest Department, the charge for the collecting establishment being debited against it.

The forests under Gibson extended over a distance, from north to south, of 550 miles, but with the exception of these fee-collecting establishments, the only establishment he had to carry out the work of his large charge throughout this period was the small one sanctioned in 1845. The only monthly sum he was entitled to disburse, out of this sanctioned establishment, for the pay of foresters was Rs.358. It is perhaps therefore scarcely necessary to comment upon the fact that in spite of the valuable personal work carried out by Gibson, conservancy *qua* conservancy failed. The fellings in many parts went on unchecked, contractors paid little or nothing for the timber they took from the forests, and gross abuses and veniality were rife amongst the low-paid subordinate officials. The position which arose will be dealt with in detail in the next period.

Madras Presidency. As has been shown in a previous chapter, the question of forest conservancy, upon which the

Collectors were not entirely in accord, moved more slowly in the Madras Presidency, and the Government was content as a beginning to make use of the services of Gibson, the Bombay Government having accorded him permission to visit Madras to give advice on the management of the forests. In Canara, Blane, the Collector, was interesting himself keenly in the matter of the preservation of the forests, and Gibson paid several visits there and endeavoured to introduce his views, more especially with reference to the *Kumri* cultivation.

This question had been first taken up by a former Collector, Mr. Blair, who in 1843 issued a proclamation directing that five valuable kinds of timber, viz. teak, pún, blackwood, jack and sandal should be preserved in the *Government forests*. That proclamation, Blane stated, had remained a dead letter, both with timber contractors and the *Kumri* cutters. The plea was put forward that the materials were cut in private forests. To dispel this idea Blane directed that when a jungle was claimed as private property the right must be established before cutting took place. It was then contended, and in certain localities perhaps with some reason, that the felling of the jungles had diminished the prevalence of fever and was therefore of advantage to the community. To meet this argument Blane confined his prohibition to the felling of the five principal species, allowing the rest of the species to be cut save in accessible forests on river banks and near the seacoast where fellings, except in the case of wood required for fuel purposes, were prohibited. These recommendations on the part of the Collector were assented to by the Board, the Collector being authorised to restrict *Kumri* cultivation to such places and to such an extent as might in his opinion be expedient for the preservation of the forests and the general welfare of the Province. This matter was again reviewed after Cleghorn's appointment as Conservator in 1856, when it was considered from the point of view of the forests of Malabar and other parts, as well as Canara.

Probably the chief reason which finally induced the Madras Government to appoint their own Conservator of Forests was the alarming decrease which had become apparent in the supplies of first-class teak in the old Malabar Forests from which it had practically all been cut out during the preceding half century. Reports stated that there was still an abundance of teak in Northern Canara, but only a small proportion of it was of the first-class—probably not more than one log in eight

of those brought to Sedashigur. In Travancore and Cochin there was still much more teak of large size, but these were Native States. It was owing to the decrease in supplies of teak from Malabar that attention had been turned to the Anaimalai Forests in Coimbatore. The operations carried out in these forests will now be glanced at.

The Anaimalai Forests. In a previous chapter mention has been made of Cotton's request that an officer should be deputed to explore and report on the Anaimalai Forests. Lieutenant Michael was the officer deputed for this work, and as an outcome of his investigations a settlement of the Colengode and Cochin boundaries was arrived at. Cotton was able to report the following number of good teak trees standing in the forest :

In the Cochin disputed territory . . .	107,000	trees.
In the Colengode disputed territory . . .	28,000	"
In the Government territory . . .	61,000	"
Total . . .	196,000	"

Minutes were written on the subject by Mr. D. Elliot, Member of Council, and by the Governor, Sir H. Pottinger, and in February, 1850, the Government sanctioned Michael's services being retained. In February, 1851, he was sent to Moulmein to learn the methods of dealing with heavy timber ; in December, 1853, to the Canara Forests ; and in 1854 he was formally appointed Superintendent of the Anaimalai Forests. The report of the working of the Anaimalai Forests given below only deals with the extraction of timber and the construction of roads, and makes no reference to forest conservancy. Michael was in charge of this work, and he had the credit of negotiating the lease of valuable teak forests from the Numbadi of Colengode.

In 1850 it was decided to work the Government Anaimalai Forests, including the contiguous forests rented from the Colengode Numbadi, by departmental agency. The Report on the working of these forests between 1850 and 1854 is of considerable interest, since it throws light on the methods of extraction in force at the time and indicates that the troubles and vicissitudes which beset this class of work in the Indian Forests were not far different seventy years ago from those experienced by the present-day Forest Officer.

The original estimates under which the sanction of Government to the operations was given were apparently drafted by

Major F. C. Cotton, Civil Engineer, 7th Division. Michael was appointed officiating Superintendent of the Anaimalai Forests, and the three reports to be noticed were submitted by him in the years 1852, 1853 and 1854 respectively, the first report being addressed to Major Cotton, the other two to Mr. E. B. Thomas, Collector of Coimbatore.

The forests to be worked were situated on a hilly tableland with a ghát dropping to the plains below. The preliminary work necessitated opening out a cart road from the top of the ghát through the forest, in preparing a slipway from the top to the foot of the ghát, and a second road from the latter point to Mungara, from whence the timber was floated down to the coast at Ponany, and the bridging of one or two rivers.

The floating work depended upon the freshets in the rivers resulting from the two monsoons in October and June or July. The working season in the forests, felling and carting and so forth, ended with the close of March, by which time both water and forage, with the arrival of the hot season, failed to prove sufficient for the requirements of the workmen and the carters' cattle.

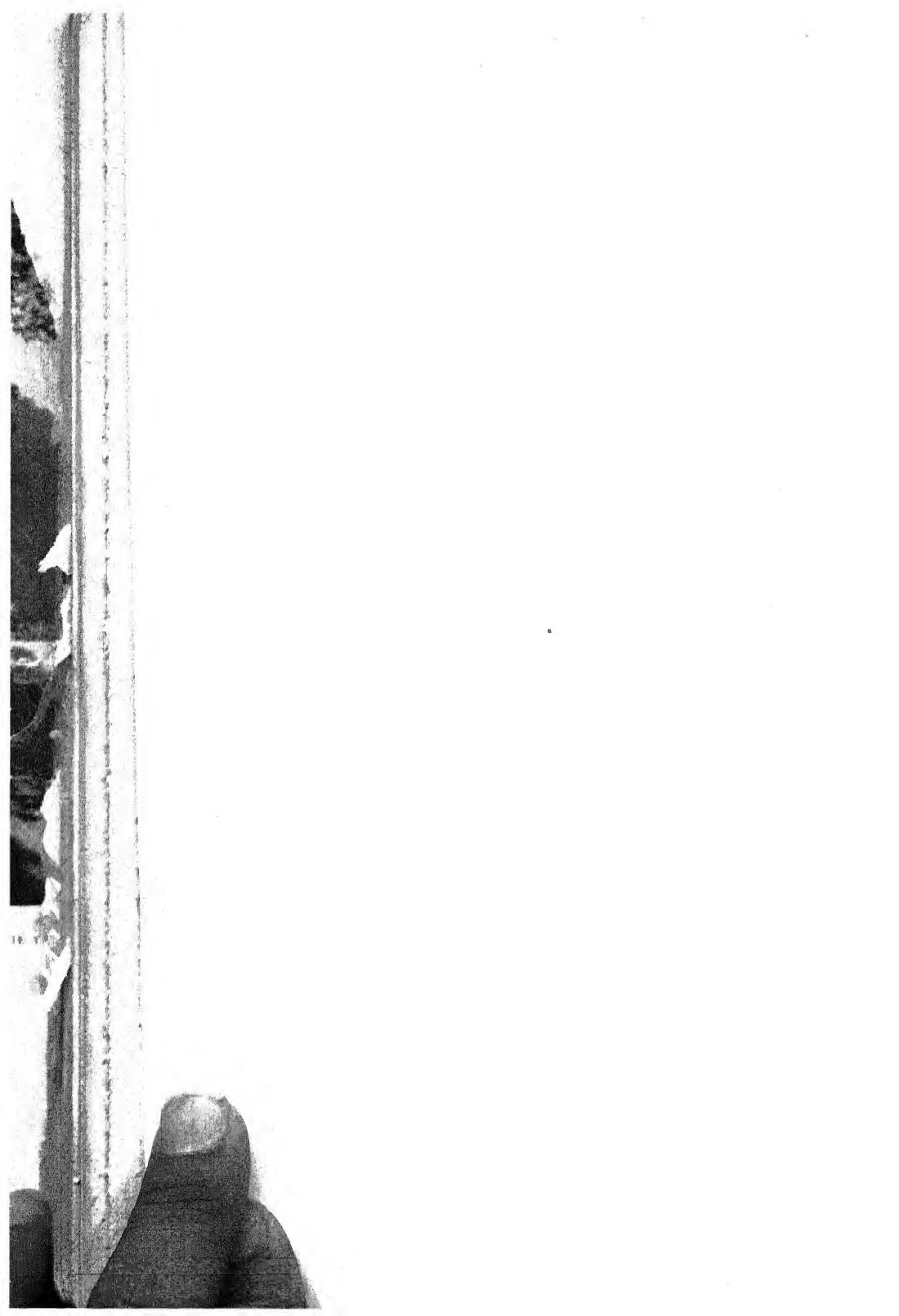
One of the most interesting features of Michael's first Report is the allusion to the effort now being made to replace in the forest the wasteful use of the axe in all felling and conversion work by the saw. Through the centuries during which the Indian Forests had suffered at the hands of the people and later from the depredations of the timber contractor, the saw was unknown. The whole of the work was done from first to last with the axe, with a waste of probably at least 50 per cent of the timber of every tree felled. The difficulties encountered in endeavouring to introduce the change amongst a people so conservative as the natives of India are well depicted in this Report; and as is so often the case in improvements of this nature, arguments were brought forward in favour of the old method which were not so easy to meet.

It had been hoped to obtain a sufficient number of sawyers to carry out the whole of the work in the forests from the start, so far at least as the material for the Bombay Dockyard was concerned. "In this," says Michael, "I was greatly disappointed, for the results of all my experiments proved that the quantity of sound planks, adapted for the Dockyard, obtained by sawing, was so small when compared with the quantity of rejected timber that it will be many years ere we can hope to procure a sufficiency of sawyers to cut 2000 planks

TEAK

VIEW OF THE ANAMALAI TIMBER SLIP
From C. Geddes's "Forests and Gardens of South India."





(the number promised to the Dockyard) in a season, or a sufficiency of carriage to remove so very large an amount of building wood as would thus accumulate, so as to be able to cover the extra expense of sawing by the sale of it."

"The planks required for Bombay are described as follows : 'It is of the greatest importance that these planks should be cut straight, fair edged, be sound and free of all defects of a serious nature, and be cut from the side pieces of the tree so as not to contain the heart-shake or centre of the tree. Now, as far as my experience has taught me, I am inclined to think that the heart-shake in the Malabar teak tree is far more extensive than that in the Burmese Forests, and this is to be accounted for by the former growing in hilly and exposed situations, whereas the latter, for the greater part, is found in low marshy soil. The consequence of this has been that all the trees I cut up this season, in the manner I had seen them cut up in Burma, turned out badly, and out of about 100 logs containing about 8000 cubic feet only about 100 inferior planks of the dimensions required for the Dockyard purposes were obtained, containing in all about 1,200 cubic feet ; and though all the remaining wood is serviceable for building purposes (part of which will be used for the Neilgherry Barracks), I was obliged to relinquish the hope of cutting with the saw alone. I therefore, in the middle of the season, recommenced cutting with the axe, and though the waste of wood is great, there is no difficulty whatever in procuring the description of wood required, perfectly sound ; for the Malabar axemen on felling a tree, and cutting it in various places, are enabled to follow the heart-shake in all its windings with the axe, and so avoid it, where in a sawn log it would inevitably appear in the planks.

"The wastage of this system of cutting is, however, much to be lamented, but as the demand is urgent it will be necessary to continue it, to some degree, till the sawyers flock more numerously to the jungle, and the carriage for the side pieces, etc., is more easily obtainable. It will, however, be my endeavour to work as much as possible with the saw, eventually, I trust, to the entire exclusion of the axe."

This allusion to the demands of the Dockyard being urgent had now run through the whole of the Government's requests for teak during a quarter of a century and more, and affords perhaps the best evidence of the total failure to realise that the absence of a forest policy and an organised working of the

forests was bound to result in an annually increasing difficulty in obtaining supplies.

Michael's staff cannot be considered excessive. He himself was paid Rs.150 a month (in addition it is imagined to his military pay) ; with a carpenter, Corporal Reid, on Rs.100 ; an overseer of sawyers, Mr. Harrington, on Rs.50 ; a writer on Rs.50 ; and thirteen duffadars (overseers) and peons, etc., the total monthly outlay being Rs.422, with, in addition, a receiver and four peons at Ponany on the coast. The felling cost worked out to 2 annas 2 pie per cubic foot, the carriage per plank of 12·4 cubic feet to the top of the slip at R.I.4.0, the slipping down the slipway at 3½ annas per plank and Rs.4 per plank for the carriage from the foot of the slip to Mangara. The cost of floating per plank to Ponany was R.I.

As was to be expected at the initiation of departmental work, Michael had to meet the strongest opposition and persecution from timber contractors and their agents. In order to show that Government work could not pay many of the planks were at first cut below the required size so as to render them useless for dockyard work—an experience which many later-day Forest Officers have encountered. In February, 1852, he lost 600 of his finest planks through an incendiary fire ; in 1850 and 1851, 1394 and 1851 planks were cut respectively, totalling an estimated 59,600 cubic feet.¹ The expenditure for the two seasons on establishment, elephants, axemen, huts, etc., was Rs.15,328, and that for carriage, slipping and floating of the planks, Rs.18,200, giving a total expenditure of Rs.33,528, or nearly 9 annas a cubic foot.² This was based on the "forest measurement," whereby an allowance had been made in the planks for deficiencies, such as cracks, etc. The Government method of deducting for these was to press the blade of a knife into the crack, and according to the depth it penetrated that allowance of timber was deducted from the whole plank ; so that, in the event of the deficit increasing, the plank might be trimmed to the thickness at which it was taken and registered. Michael's estimated 59,600 cubic feet was at least 20 per cent less than the actual measurements of the planks.

In addition to the plank cutting the work carried out in

¹ If the plank is taken as containing 12·4 cubic feet, the total contents of the three lots of planks, viz. 600, 1394 and 1851 equals 47,678 cubic feet.—A U T H O R .

² On the above calculation it would equal 11 annas per cubic foot.

the forests included road work, the preparation of logs for the gun-carriage manufactory and felling log timber for the same purpose, 14,500 cubic feet of the latter having been cut. A bridge over the River Colengode, a work of great importance to the country at large which no private timber contractor would have ever undertaken, was also built. And in addition to the above Michael stated, "my leisure moments have been occupied in rendering such assistance as has been in my power to the Collector of Coimbatore, in collecting the Hill produce of the Anaimalais from the Kaders, and in endeavouring to ameliorate the condition of this heretofore oppressed race—by inducing them to cultivate the land, and to become partially civilised—which endeavours have now every prospect of being in due course of time crowned with success." Many an Indian Forest Officer since Michael penned these lines has, in the course of his duties, carried on the same class of civilising work and held out the hand of fellowship to the wild and uncivilised races who roam the great jungles of Hindustan.

After the delivery of the first batch of 1578 planks to the Bombay Government Agent it was possible to show at the end of December, 1852, that the result of the departmental working since its initiation in 1850 had been a great saving to Government. The deductions made for splits, cracks, etc., amounted to 23 per cent, so that Michael's estimate of 20 per cent was not far out. The saving effected by the Anaimalai working was on two heads. Owing to the expected arrival of the Anaimalai teak at Ponany Mr. Poulten, the Government Agent, reduced the prices of planks offered for sale by the merchants by about 15 per cent. Taking the average price paid by Government for this material for the five years, 1847 to 1851, it was demonstrable that the Government working had not only prevented the price from increasing in 1851 as would have been the case, owing to the greater distance, had the merchants worked the Anaimalai Forests themselves, but had actually resulted in a decrease of the market prices.

The average price for the five years were as follows :—

1st Class Planks,	67	rupees per 100 kolls (26½ cubic feet).
2nd „ „	64	" "
3rd „ „	54	" "
4th „ „	49	" "

Fourteen hundred and one planks = 17,378 cubic feet were classified into these four groups, the greater number into classes 2 and 3, and at the above average valuation were worth Rs. 39,063. The bulk of this timber was not the best cut, since 600 of the finest planks had been burnt. The timber thus lost had been estimated to equal about 15,000 cubic feet,¹ and taking it to have been half 1st and half 2nd class timber was worth Rs. 33,947, giving a total value of Rs. 73,000 for the material which would have been delivered to the Government Agent by the end of 1852, or Rs. 28,765 in excess of the whole sum expended in the Anaimalai Forests, including roads, bridges, etc., since the start of the work. In addition there were at the time 2700 planks at the foot of the slip, and 22,500 cubic feet of loss, heads and bolts for the gun-carriage factory and rejected timber suitable for the Neilgherry Barracks work still in the forest or at the foot of the slip awaiting carriage. The former material went from the foot of the slip to Vangul, whilst the latter was sent to Metapolian from whence it was carried up the hill to Wellington, etc., for the construction of the barracks. Thus, in addition to the ten miles of cart road, driven through the forests from the top of the slip, over which 150 carts passed daily, Michael had three roads from the foot of the slip, all of which he had immensely improved and bridged over the river and nullahs, thus conferring an immense benefit on the country-side.

Trouble still continued to be experienced from the sawyers, and to obviate it Michael commenced felling the teak green, instead of dead, as the men said that the shake was greatly intensified by the fall of the dead as against the green trees. Consequently the sawyers refused to touch the girdled trees owing to the loss they incurred from sawing up trees with the shake. The planks cut from the green trees sent down with the others were found to be much freer from shake and were accepted by the Government Agent, "as being of fine quality and particularly free from defects." These planks were allowed to lie in the forest for some time after being prepared so as to partially season.

The season of 1853-4 began very auspiciously. Workmen and carters arrived in numbers. But within a brief space that dreaded scourge cholera broke out, and in a few days the whole of the men left and did not return for a month. But by the

¹ Or 25 cubic feet apiece.

end of the season, 1353 planks had reached the top of the slip. The planks, etc., of the previous working season had been already carted to Mungara in time for the October freshets, but these latter failed completely, thus delaying the work. Eight hundred and fifty-three planks reached Ponany, and were passed as mostly 1st and 2nd class timber, being pronounced by Mr. Poultney as timber of a very superior description. These planks at the old market prices would have cost Government about Rs. 30,000, or Rs. 3000 more than the total expenditure of working the forests during the season 1853-4, and including the cost of the Marchenaikenpolliam bridge on the road to Vangul. This latter road proved as great a benefit to the country-side as did that to Mungara.

The Report for 1854 is the last of the records of the period on this departmental working. In the four years Michael had to face the misfortunes and vicissitudes so common in India, opposition from the merchants, incendiaryism and conservatism, floods in the rivers and then drought, preventing the floating operations, and disease in the form of cholera. These experiences delayed his timber from reaching the seacoast and the Government Timber Agent. But the Anaimalai work was a fine commencement at organised working, and furnished proof that departmental working was a possibility, and that it resulted in lowering prices. It also provided evidence of the benefit it carried to the country-side, both in the improvement of lines of communication and in the certainty that the local people employed in the forests would be properly paid for their labour and not defrauded of their just dues, as was so prevalent in those days. For these reasons it has been placed on record here.

As has been recorded, Michael was formally appointed Superintendent of the Anaimalai Forest in 1854, and he started a system of clearing teak seedlings, and young teak trees from dry leaves and other inflammable matter in the forests, so as to protect them against injury from the annual fires of the dry season.

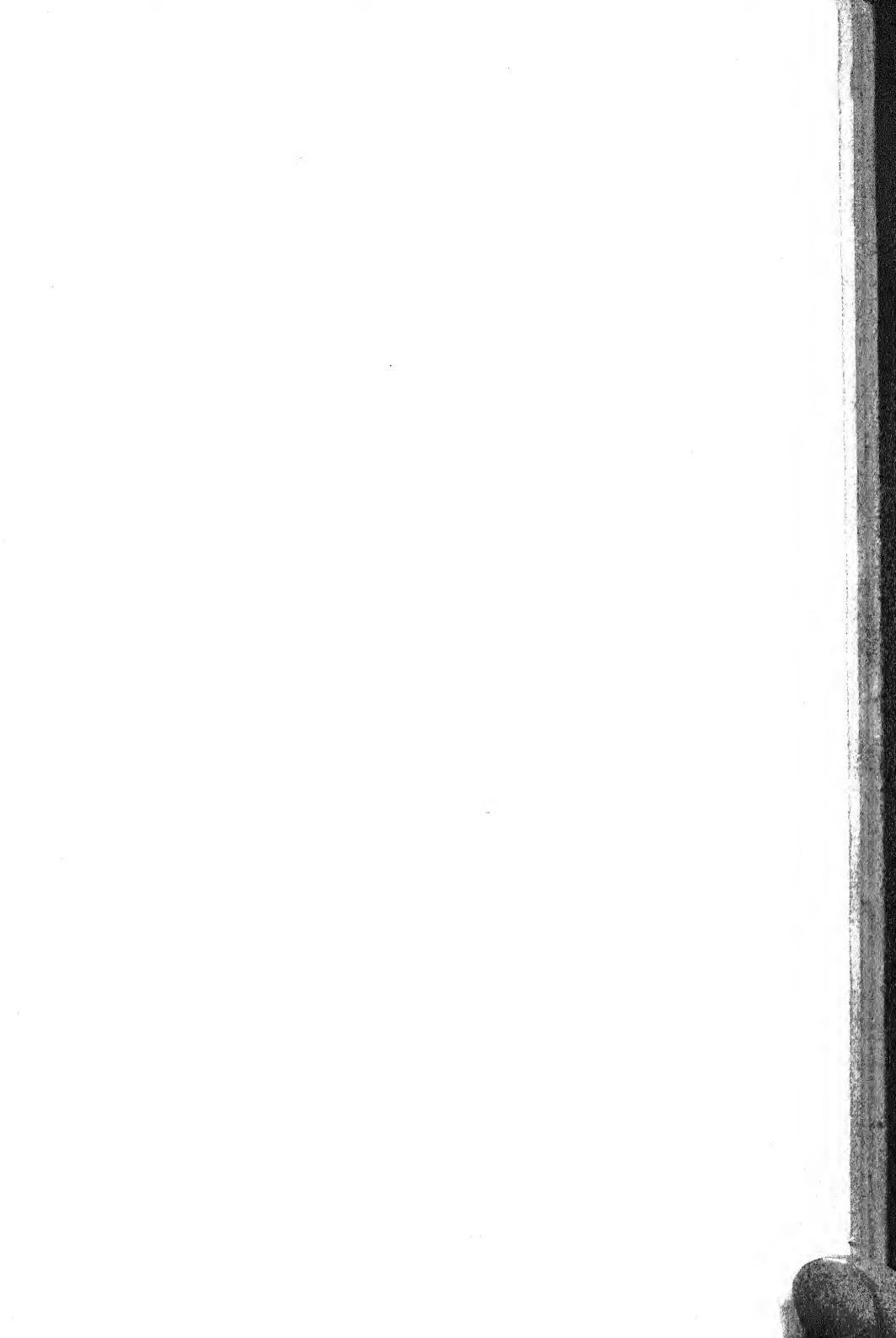
In 1856 Michael went on leave, and Captain (later General) Douglas Hamilton was appointed in his place. He was in charge of the Anaimalai Forests for several years, and at a later date—after a regular Forest Department for the whole Presidency had been organised—Hamilton was succeeded by Lieutenant (later Colonel) Beddome.

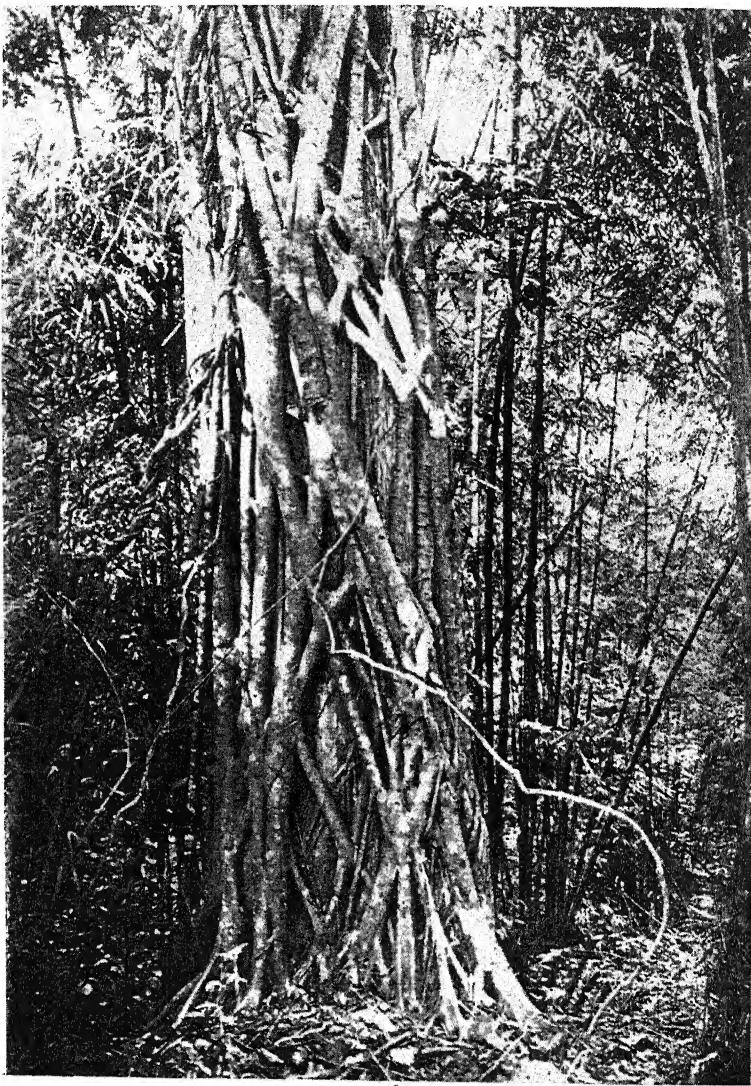
Michael, Hamilton and Beddome were all names which were

to become famous in the early annals of the Forestry Department in India.

In August, 1856, Cleghorn submitted a report to the Government of Madras, containing proposals for establishing Forest Conservancy. These proposals were sent up to the Government of India for sanction, which was accorded in November.

On the 19th December, 1856, Cleghorn was appointed Conservator of Forests in the Presidency of Madras. He spent the following year in touring through and examining the forests.





FICUS ENCLOSING A TEAK TREE. GIRTH OVER FICUS, 17 FT. 5 IN. BURMA
From Troup's "Sylviculture of Indian Trees"

CHAPTER XIII

FOREST OPERATIONS IN BURMA (TENASSERIM), 1850-1857

DR. FALCONER'S REPORT

AS has been shown, Mr. Colvin, Commissioner of Tenasserim, organised, after Captain Latter's resignation in 1847, what amounted to a small Forest Department, one of the Commissioner's Assistants being placed in charge, and made proposals to Government on the subject of granting perpetual leases of the forests to timber contractors on certain conditions. The most important of these were that the latter should undertake to replant teak on the areas from which they cut the mature trees, and that they should be prohibited from felling young trees. The proviso that the areas felled should be replanted with from three to five young teak for every one removed, had, indeed, formed a condition of the old leases, but it had never been carried out. Grave fears were, therefore, entertained that, with such staff as it was considered financially possible to maintain to superintend the forests, it would be impossible to ensure that licence-holders would carry out in the future a condition which had been so flagrantly disregarded in the past. To solve this question Dr. Falconer, of the Calcutta Botanical Gardens, was deputed in 1849 to visit and report on the Tenasserim Forests, with especial regard to the amount of teak timber they still contained, the abundance or otherwise of young teak growth, the probability of the licence-holders replanting their areas and the possibility of forming plantations, or otherwise securing adequate supplies of young teak on the areas, to ensure the conservation of the forests.

Falconer submitted his Report in January, 1851.

After describing the two species of teak in Burma (*Tectona grandis* and *T. Hamiltoni*), of which the former is the chief timber species, and briefly alluding to the geographical features

of the country, Falconer reviewed the previous history of the teak forests from Wallich's tours downwards, pointing out how the latter's warnings that the making over of the forests to timber contractors would inevitably result in their ruin had come true. The four Government nurseries or plantations formed by Captain Tremenheere in 1843 had entirely failed, want of adequate supervision being the cause. It was admitted that the teak trees still standing in the forests were annually loaded with good seed, millions of which annually strewed the ground; yet while the Government surveyors and grantees alike agreed that the forests were rapidly approaching exhaustion, it was equally admitted that in the valuable and extensive Attaran Forests there was no appearance of young trees rising to replace in adequate numbers those which had been felled. All were agreed on this head, with the exception of Latter, who made the extraordinary statement that in his opinion healthy adult teak did not yield good seed, but only trees which were in a state of decrepitude and decay, an opinion which would scarcely have required the authoritative disclaimer it received, were it not for the fact that Latter's Reports on his tours had been printed and widely circulated by Government. Latter's explanation of the action of the epiphytic species of *Ficus*, found so commonly enclosing the teak stems on the Attaran, or, as he termed them, the species of parasitical *Ficus*, was also a curious one. After describing the way they spread round and up the tree he stated, "till last comes the closing scene—the parasite has entirely enveloped the original tree in its deadly folds, and absorbing all the juices of its life, nothing remains but the projected stump of some withered arms to show that any other plant had been there." This drew from the Doctor the following sarcastic comment and interesting explanation: "The epiphytic species of *Ficus* . . . enclose the teak in their embrace, in the manner described by Captain Latter, except that they are not true parasites, and do not suck the juices of the trees upon which they grow, using them merely as fulcra of growth. They chiefly fix upon very large trees, and infest other forest species besides teak, in the course of time smothering and destroying the finest timber in the forests. The reason of their being so frequent on teak I believe to be this: the Tenasserim Forests abound in two large species of *Buceros*; these birds feed largely upon the fruits of the Nyung-ben, or wild figs; they are timid and very wary in

their habits, and generally perch upon the highest branches of the loftiest trees having any tendency to deciduous leaves. The tall teak trees are, in consequence, their favourite haunts : and the fig seeds after digestion are dropped by them in the most favourable condition for germination, and are caught in the forks of the large branches, whence, after germinating, they send down their long roots along the trunk to the ground, and ultimately envelop the tree. As these parasites infest only the largest trees, the obvious remedy is to fell the timber upon which they make their appearance."

To return to the teak natural regeneration. It was only in the forests along the Thoung-Yeen River that fair crops of young teak had been reported.

Falconer set out on his tour to investigate and report on these matters. Captain Berdmore, of the Madras Artillery, an Assistant to the Commissioner, in charge of the Forest Office, accompanied the Doctor on his tour, the party leaving on January 30th, 1849. They first visited the forests on the Weinyo and Zimmé Rivers, and then inspected the Kyoon-Geown, Megwa, Mittigate, Mittigate Codoogway, the Upper Mittigate Forests and those on the Goonjee Creek, Toung Wyn and Natchoung ; the teak coming to an end at the latter which, being the nearest to Moulmein, had been completely worked out, although the teak it yielded was of a stunted inferior kind.

Falconer summed up the general results of his tour as follows : "The teak forests upon the Weinyo and Zimmé Rivers are in rapid progress of exhaustion. The forests which were in the hands of native licence-holders have been, in most instances, entirely cleared out both of large timber and of undersized trees approaching the regulation standard. The large forests towards the heads of the rivers, held by Europeans of capital, have been actively worked for nearly twenty years, and are also either in the same condition, or will be speedily exhausted. Of the three reserved forests formerly held for Government, the Mittigate Codoogway has been leased out, and is now under the full operation of the axe ; its resources having been largely drawn upon before it was held in reserve. The only two now reserved, viz. the Thengan-nyee-Nyoung and the Upper Mittigate, instead of being intact forests, have been partially worked by trespass, by the adjoining forest holders—the former to a large extent, the latter in a less degree. Both forests contain standing teak timber of large scantling,

the Upper Mittigate in particular abounding in the finest trees. So general and indiscriminate have been the fellings upon the Weinyo and Zimmé that, but for the timber in these two reserved forests, it would now be a matter of record only that teak of large size has ever been produced on the Attaran.

" Young timber is nowhere rising in adequate quantity, either to renew the forests or to keep up the supply. The reason of this having been that the forest regulations up to 1846 were inoperative, and undersized trees were felled equally with the large timber, the greater facility of dragging them through the forests, and the ready sale met with at Moulmein, having held out irresistible inducement for their consumption.

" The forests have been worked, even by grantees of capital, entirely with a view to immediate or speedy returns ; their maintenance for future supplies, and the creation of prospective property, have in no case been attended to. The owners have rarely, or only at long intervals, visited their grants : they have been in the habit of carrying on their operations by means of native agents, who have conducted them with reckless waste and improvidence. The most destructive agent, after the axe, I consider to have been the periodical fires ; and these are referable in most instances, in the remote forests on the Attaran, to conflagrations purposely caused by the working parties, so as to clear the grass jungle, and enable them to move with safety about the forests. I believe these fires to have been much more prevalent since the country passed into our hands than they were when the forests were in the state of nature. Planting young trees, or raising nurseries from seed, has in no instance been attended to by the grantees, or if there has been a solitary exceptional case, the attempt has been made with so little effort to attain success, that there is probably not a young tree in the whole of the forests that owes its origin to the hand of man.

" Although young seedlings of spontaneous growth are occasionally met with, as in the case of the young eight-year-old teak seen upon the Thengan-nyee-Nyoung River, they are, generally speaking, rare in the Attaran Forests, and bear no proportion either to the vast quantity of good seed annually produced, or to the trees which have been felled, or are still standing, and consequently to the requirements of the forests for renewal."

Falconer stated that the above observations of his own merely confirmed, by a later observer, the statements already

made in the reports of Captains O'Brien, Tremenheere and Guthrie.

Wallich had attributed the absence of teak seedlings in the forests entirely to fire. O'Brien agreed with this opinion, although he observed how apt the buoyant and light nature of the seed rendered it to be floated away during the rains. But Falconer was of opinion that fire alone would not account for this absence, as was proved by the observations made in the Upper Mittigate and elsewhere where the trees were very dense and shady, without grass jungle, and where the sound condition of the fallen timber showed that the tracts had not been ravaged by fire for many years. And yet seedlings were uncommon in these forests. But the Doctor added the following remark : "The amount of destructive agency which is exercised by the fires, is proved by the *prevalent age* of the young and undersized trees which are met with in the exhausted forests, the majority of them being about 20 or 25 years old, dating, in fact, from the period immediately preceding the time when the forests began to be worked and to be systematically burnt. Seedlings or young trees under that age are comparatively very rare."

Falconer offered the following solution of the general absence of teak seedlings in the forests : "Assuming it to be an established fact that teak seedlings are more numerous upon the Thoung-yeen than upon the Attaran River, the only reason I can assign for the difference is, that the teak on the former grows in a hilly country, upon elevated steppes or cliffs, or hill-sides, where the nuts meet with more chances of entanglement from irregularities of the surface, so as to arrest their removal and lodge them in pits or cracks, or under stones—thus giving them the accidents favourable to germination, while the parent trees are in many situations so difficult of removal that they are allowed to stand. In the teak plantation formerly attached to the Botanic Garden the surface of the ground is very broken and uneven. Spontaneous teak seedlings have been constantly observed to be more numerous there than in the cultivated parts of the garden, where the trees stand upon smooth and well-mown lawns, although the parent trees are alike in every respect. I do not think that difference of soil has anything to do with the asserted difference between the Attaran and Thoung-yeen Rivers, as regards their relative production of teak seedlings ; for the teak grows upon a wide range of soils, occurring equally

in the black heavy cotton soil and rugged cliffs of Malabar, Canara and Travancore, and on the moist rich bottoms of the upland valleys, or sandy banks of the creeks on the Attaran River. Soil will affect the growth of the tree and the quality of the timber, but it will not determine the numerical production of seedlings. It may be asked, with so many alleged inherent obstacles to the propagation of teak, how were the forests kept up in the state of nature, and why have they fallen off so much now? The reply to this is, that although the forests in their virgin state produced myriads of seeds, they show now, by the infrequency of large teak trees, that few of those seeds met with the concurrence of accidents favourable to their growth into young plants, whereas since they have been worked by man, the number of adverse conditions have been augmented by the agency of fire, at the same time that the source of the supply of seeds has been vastly diminished by the active felling of the adult trees."

Falconer then pointed out, though the inaptitude of the teak seed for the propagation of the species in the wild state might at the time apply, young seedlings could be readily reared artificially, and he instanced and described the Conolly plantations in Malabar, which have been already referred to.

Commenting upon Colvin's recommendation that the licences in the Attaran Forests should be converted into leases in perpetuity with a final clause of resumption unless the grantees should have, at the end of ten years, planted one-half or one-third the number of trees that had been removed on the average of the last ten years, and that the tenures should include a right of property in all the trees and products of the forests, Falconer said that the only doubt apparently existing in Colvin's mind on the subject of these perpetual grants was whether it was, in fact, really practicable, in view of past failures, to renew the forests by artificial culture.

From the example afforded by Conolly's work in Malabar Falconer considered it already proved that the forests could be so renewed. But he doubted whether it could or would be done by the grantees. The experience of the past twenty years was against it. The latter had in no instance shown any interest in or wish to replant the areas they felled, or to spend any money on making provision for a period some eighty years ahead. Their only object had been to exploit the timber and make as much money out of it as possible in the shortest space of time. As one source of timber became exhausted,

other more remote tracts were explored until the merchants went far beyond the boundaries of the Province and drew their supplies from the Shan States upon the Thoung-yeen, whence the greater part of the timber was then being derived. The grantees were fully awake to the impending exhaustion of their grants, but in no instance was a steady effort being made to maintain the value of the property for the future by planting ; rather, the future was anticipated by felling every tree of commercial size. And this, in spite of the fact that, although their tenures were licences revocable at will, between 1829 and 1846 no licence had been so revoked, ejectment measures resorted to by Guthrie having been immediately discountenanced by Government. Moreover, these licences had been sold again and again and passed from hand to hand, so that few of them now remained with the original holders. If such had been the results in the past, when the forests were stocked with teak yielding handsome profits, how could it be expected that the grantees would now restock the exhausted forests with no prospect of a return for nearly a century ? As to the value to the grantee of the other products of the forests, the demand for timber at Moulmein was confined to teak ; for other woods it had still to be created. This it may be remarked was almost true half a century later. Also at that time there was no resident population in the Attaran Forests to work upon the miscellaneous products. Falconer contrasted the idea of the new leases with the opinion expressed by Sir Thomas Munro in Madras in the Minute abolishing the Conservatorship in 1822, that the proprietors would replant their forest areas, and stated that the principle, however sound in the abstract, was much in advance of the existing conditions and prospects.

On whatever principle the licences were dealt with in the future, he pointed out that the renewal of the trees was the main object of the lease, and therefore the number of young trees to be raised by the grantees should be fixed without exacting more than could be reasonably obtained. In Travancore *ten* young trees were planted for every full-grown tree felled. Blundell, in 1841, had prescribed *five* and Tremenheere, in 1842, reduced the number to *three*. Colvin suggested one-third to one-half of the whole number of trees extracted from the grant in the previous ten years. The objection to the latter was that as the teak trees stood widely apart on the area in mixture with a number of other species, the grantee could

easily crowd a number of young trees at 6 feet apart on to a few acres in a corner of his grant and thus have the total number required ready for the inspection. But this would have little useful effect on replanting the whole of the area from which the old teak had been removed during the previous ten years. And this, of course, was the object aimed at.

The extent of the forests upon the Attaran which it was suggested should be leased was approximately estimated at 228 square miles, 110 of which were reckoned to bear teak very unequally distributed on this area. Assuming that these forests were given under perpetual leases, Falconer recommended that the following replanting conditions should be inserted in the leases, on the principle that the proportion of the surface brought under teak planting was of greater importance with reference to the efficient renovation of the forests, and their ultimate productiveness, than the number of plants raised in a crowded spot.

Supposing, said Falconer, the forest trees, large and small, to stand 30 feet apart, there would be 30,976 to the square mile; and assuming one in ten to be teak, there would be 3097 to the same area, and 340,736 over the whole extent of teak-yielding forest. This number was considerably in excess of any returns that had been made of the actual contents of the teak forests upon the Attaran rivers, which Guthrie fixed as low as 93,458 large and small, but excluding very young trees upon an extent of $140\frac{1}{2}$ square miles. The rate here given, however, was low for the area, as it would allow less than five teak trees (4.84) to the acre, and it was not much in excess of what some of the best forests had been supposed to bear. O'Brien considered that there were from 10,000 to 12,000 full-grown teak trees fit to cut upon the Kyoon-Geown Forest in 1841, with an unusual abundance of young trees. This forest, which in the returns was fixed at 8 square miles, had been at that time worked for ten years, and if O'Brien's estimate were adopted as nearly approximate, and assuming the young trees to have only equalled the full-sized ones, there would have been from 20,000 to 24,000 teak, large and small, on Kyoon-Geown. The same area (8 square miles) with 4.84 teak to the acre would yield 24,780 trees, and it did not appear that an adequate and beneficial renovation of the forests, so far as the interests of Government and the well-being of the Province are concerned, could be well fixed at a lower rate. The objection at first sight was that it was framed too low.

In order to carry out this principle Falconer advocated that the leases should contain conditions that the grantees show, at the end of ten years, that one-half of the area of their forest holdings was either planted out or bore young natural teak growth, at the rate of 4·84 per acre or 3097·6 to the square mile, estimated upon the whole of the grant, exclusive of full-grown trees. This would leave half the area at their disposal for occupation or otherwise, and imply 9·68 young teak upon the acre of the moiety under teak culture. At the end of the ten years the grantees would have to show 320 acres per square mile planted throughout with young teak and bearing not less than 3097 trees, or an annual planting area of 32 acres containing 310 trees.

This proposal of Falconer's, which was in effect to get the plants at once placed at the distances best suited to their growth to maturity, did not apparently take into account that a proportion of these young trees would almost certainly fail, either from being smothered by the more rapid-growing soft-wooded species, bamboos, etc., since the young trees might be planted the year before the inspection was made and be killed out a year or two afterwards; nor was any provision made for death by disease, insect attack, and so forth. For the Doctor did not appear to contemplate that any supervision could be given to the young trees so widely spaced apart, which were apparently to be subsequently left to fend for themselves. It appears an obvious statement to make that, for the 4·84 mature teak per acre found standing in the forests, a far larger number per acre must have become eliminated in the struggle for existence during the growth to maturity. Consequently to make fairly certain of obtaining the 4·84 trees per acre at the end of the rotation it would be necessary to start with a far larger number.

Falconer deprecated the idea of asking the grantees to make plantations on the Conolly lines owing to the cost of looking after them, which the grantees would not be likely to face as there would be no sale for the thinnings owing to the lack of a local population, whilst the expense of rafting them to Moulmein would not pay; for bamboos being so abundant and in universal use, small pole timber had little value. Tremenheere had suggested that if the licence-holder would not replant his forest area it should be done by Government at his expense. Falconer agreed with Colvin that this was inadvisable, adding, "The grantee should be alone responsible for his own failure

or success, and the Government officers ought in no wise to be mixed up with his operations." Forest Officers nowadays would scarcely agree with this opinion. Falconer considered that his plan should be offered to the licence-holders, who should be given a fair chance to comply with the Government terms; failure to comply would result in the resumption of the leases, the land reverting to Government "in order to terminate the present unsatisfactory state of things."

The Doctor advocated the same conditions being made in the leases for the Houndrow and Lhang-booa; the latter forests being in the hands of native holders, he remarks, "it is not contemplated that they would undertake leases involving outlay on planting."

With reference to the reserved forests, then limited to the Thengan-nyee-Nyoung and Upper Mittigate, Falconer advocated their retention. They possessed great capabilities for conducting planting operations advantageously, on a large scale, while the teak crop standing upon them was considerably below what the area could be made to produce. The forests had, as has been shown, been worked in open defiance of their reservation, showing the impossibility of enforcing rules in the forests and preventing trespass without an adequate staff. "It seems to me in every way expedient that they should be brought up to their full capabilities, both as prospective sources of supply of the best timber and as a practical illustration to the leaseholders of what may be effected by a judicious system of operations and a sufficient outlay. The grantees may, with some justice, expect that Government will take the lead in showing the practicability of the conditions, which it is proposed to render imperative upon them."

This enunciation by Falconer of the policy that Government should show the way to the commercial community in proving the commercial possibilities of the exploitation of the products of the forests is of importance. Although when applied to the formation of plantations on areas leased and lumbered by the timber merchants it has as a general rule proved a failure in the past both in India and other parts of the world, such as America and Sweden for instance, and is moreover in many States a matter whose desirability is of debatable value, since it results in a considerable area of the soil of the State being owned by the trader, to the disadvantage of that portion of the community inhabiting such areas. But in the case of the commercial exploitation of foreign products and their

utilisation in industries it will be subsequently shown that the Indian Government gradually recognised the duty of the State in this connection and, by initiating departmental exploitation at the outset, proved the commercial possibilities of the new departure and then left to the merchant the further development of the business on the commercial scale.

For the two Government reserves above mentioned Falconer advocated the establishment of nurseries and the rearing of young seedlings on the Conolly plan at Nilumbur. Instead of planting out the seedlings at 8 feet apart, as was done at the latter place, he advocated putting them in at 20 feet apart or 109 to the acre so as to save the expense of early thinnings, for which there would be no sale. During the first five years he advocated filling in all failures amongst the young plants. In any locality where it might be desirable to grow medium-sized useful timber, intended for felling before the tree had attained its full dimensions, he suggested putting in the seedlings at 15 feet apart; by felling alternate trees, when they had reached marketable size, the rest of the trees for the production of larger timber could be left at 30 feet apart, "nearer than which I do not consider that sound timber trees could be grown. The planting in both cases would be so managed that the trees when full grown should stand in alternate lines. After five years the young trees might be expected to have attained 15 to 20 feet in height, when they might be left to themselves—making suitable provision against fire, where the plantations are exposed to that contingency."

Falconer said that he was not in a position to frame any estimate of the cost of this plantation work, the nearest approach to that kind of operation with which he was acquainted being the tea plantations in Assam, which was hardly an analogous case.

Falconer dismissed O'Reilly's suggestion that new teak plantations should be formed near the coast-line instead of in the malarial parts of the teak area proper in Tenasserim, which were distant from the seat of Government, rightly saying that it would be unadvisable to abandon the known favourite habitat of teak for localities whose capacity for the growth of the species were unproved and only problematical. He also totally disapproved of Helfer's suggestion for renovating the teak forests by scattering teak seed wholesale throughout them, without any preliminary preparation of the ground or regard

to system and arrangement, arguing that since Nature had failed to maintain the necessary supply of teak seedlings in the forests, in spite of the large annual production of good teak seed by the trees, sowing seed by hand over these areas could not produce any better results.

Falconer concluded his Report with the following strongly worded recommendation :—

" In order to carry out any measures of renewal of the teak forests in the Tenasserim Province with success, I consider it to be indispensable that a qualified Conservator be appointed, who should have no other duties to attend to besides the charge of the forests. The Officers who have filled the appointment since 1841 have most of them held it in conjunction with other responsible avocations, requiring their presence in Moulmein, and although they have evinced much zeal and ability in the general administration of the forests, they could not be expected to be possessed of the theoretical and practical knowledge of arboriculture required in an efficient conservator, and which were essential for conducting operations to a successful issue. To this cause I attribute the failure of the nurseries established in 1843, and the want of any subsequent effort to replace them. These officers, from the circumstances above noticed, had not probably that weight and influence with the grantees which their office ought to have carried along with it. The practical administration of the forests since 1848 has been made over to the Commissioner's Assistant, and a sufficiently well-organised system is in operation for regulating the felling and collection of the timber duties, but the ' Conservancy ' of the forests, properly so-called, is entirely unprovided for, and I would not recommend that any measures of renewal be commenced upon till the vacancy is suitably filled up. The Government would then have the assurance that they were conducted with professional skill and a thorough knowledge of the subject. Errors and causes of past failure would be avoided or, when committed, they would be speedily remedied. The grantees would have a qualified authority on the spot to refer to for information and advice, which I consider to be of great importance."

As was abundantly proved later on, the last thing the grantees wanted was to have a proper qualified Conservator in charge of the administration of the forests.

But Falconer's strong recommendation, backing up the demands in this matter of the Madras and Bombay Govern-

ments, and a year or two later supported by Dr. McClelland in Pegu, eventually resulted in the appointment of Dr. Brandis as the first trained Conservator in India. Dr. Brandis was appointed to Pegu in 1856, but the Tenasserim Forests were added to his charge in 1857. During the years which intervened between Falconer's visit and this appointment the management of the latter forests remained very much in the position his Report describes them, although, as will be shown, McClelland laid a foundation in Pegu upon which Brandis built.

CHAPTER XIV

FOREST OPERATIONS IN BURMA (PEGU) 1850-1857 (*continued*)

DR. McCLELLAND'S WORK IN THE PEGU FORESTS AND THE FOREST CHARTER

THE annexation of Burma was perhaps to some extent an outcome of the valuable teak forests the country contained. The annexation of the two southern Provinces of Burma, Tenasserim and Martaban, took place at the end of the first Burmese War in 1826. This annexation was primarily due to the necessity of safeguarding our south-eastern frontier, which the chaotic conditions engendered by the misrule of the Burmese Government rendered otherwise untenable.

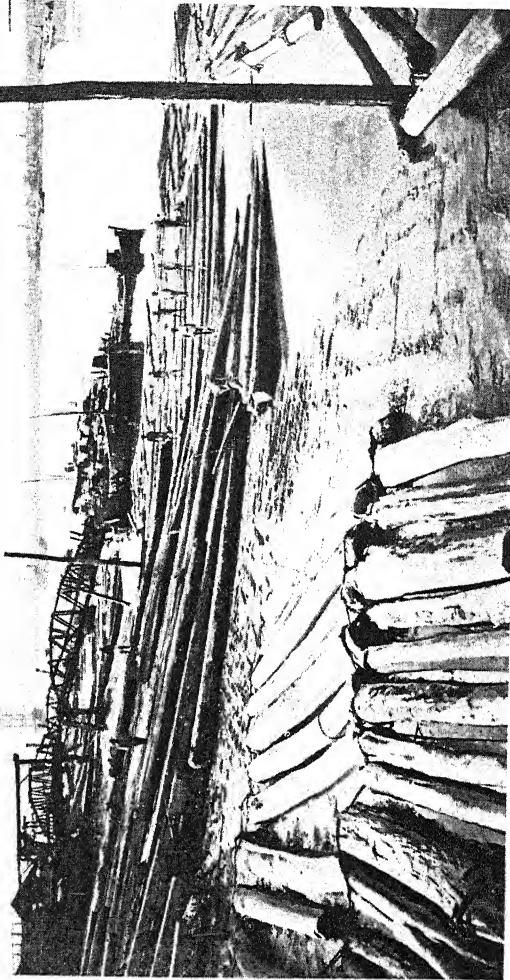
It has been shown that under the unfortunate licence system introduced, the teak forests in this region were nearly cut out during the ensuing quarter of a century.

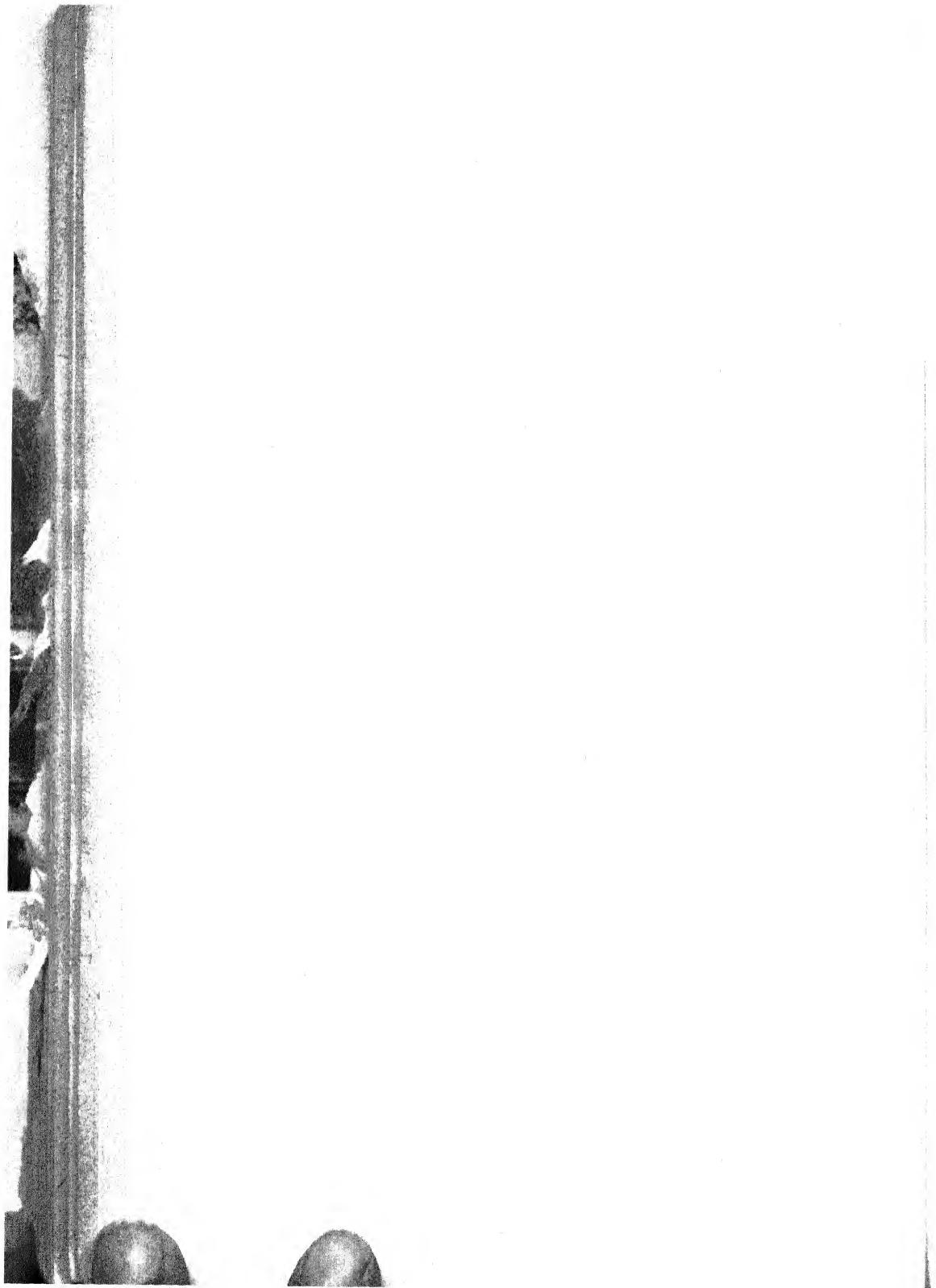
The outcome of the second Burmese War was the annexation of the Province of Pegu by proclamation on the 20th December, 1852. Rangoon was the capital, having been founded by the Alompra dynasty in 1775. It had been the principal mart for the export of teak timber for nearly a century, teak being the chief staple industry of the port. The teak tree had been proclaimed a royal tree by this dynasty and was consequently regarded as a royal monopoly.

Following this precedent soon after the annexation, a notification was issued by the British Government stating that "all the forests are the property of Government, and no general permission to cut timber therein will be granted to anyone."

The Government of India therefore made a distinct claim to the full ownership of the teak forests and their contents, as expressed by the words, "All the forests are the property of Government," and their instructions to the Superintendent were that "the Superintendent of Forests will mark the trees

RAFTS OF TEAK TIMBER ON RIVER BANK ALONGSIDE A SAWMILL, RANGOON.
From India Office Album.





which may be bought and felled. He will, for the present, be guided by the general principles under which the Travancore Forests are cut, and replenished by nurseries. The price paid for the unfelled log will be inclusive of all duty. The Commissioner will hereafter report what amount should be fixed per tree."

In spite of these definite instructions both Captain Phayre, the Commissioner of Pegu, and Dr. McClelland, who was appointed the officiating Superintendent of Forests, regarded the sale of the timber from the viewpoint of the 15 per cent duty levied in Moulmein under the licence system which, as has been shown, had ruined the Tenasserim Forests. It was this view and other expressions of opinion by Captain Phayre on Dr. McClelland's proposals which, as we shall see, gave rise to Lord Dalhousie's famous Minute of 1855 which has already been alluded to as the "Charter" of the Indian Forests.

Soon after taking up his new post the Superintendent made a tour of the forests and compiled the result of his observations in an interesting Report dated 5th April, 1854, to be now noticed. During this tour he visited the southern forests of the new Province, that is those situated on the feeders of the Hlaine, Phoungyee and Pegu streams, which fall into the Rangoon River. McClelland's description of this tract is as follows : "The Yomah Mountains, the central chain of Burma proper, are extended into Pegu and form the spine, as it were, of the Province with the valley of the Irrawaddy on the west and that of the Sittang River on the east ; and the several minor valleys lying between the off-shoots by which the chain is terminated in the south, as the valley of the Zamayee or Pegu River, the valley of the Hlaine or Line River, together with the intermediate valley of the Phoungyee or Paizoondown Creek, lying between the Hlaine and Pegu Rivers." The Superintendent's description of the route he took and the extent of the population at that period is of interest.

"In our late tour we ascended the Thounzai Valley in the Hlaine district to its head, and descended through the Oakkan Valley, and having traversed the forests from thence to Mazalee, ascended the choung (stream) of that name and thus crossed the boundary ridge from the Hlaine into the Phoungyee Forests, which, having explored on both sides of the valley, we crossed the second boundary ridge from Phoungyee and descended into the valley of the Zamayee River, from whence

we ascended the third boundary range which separates the Zamayee, or Pegu Valley, from the plains of Shoay Gyeen or Sittang, and explored the forests on both sides of the Zamayee Rivers. The chief seat of population appears, as might be expected, to be confined to the banks of the main streams in these districts, where a broad expanse of good rice land occurs. In the Hlaine district, although disturbed by small dacoits, chiefly cattle stealers, the villages are all occupied. But in the Phoungyee Valley many are more or less deserted, but none entirely so, as I observed to be the case in the Pegu or Zamayee Valley. At a rough estimate I should suppose the population of the Hlaine Valley at present to be about 10,000, of Phoungyee 5000, and the Pegu or Zamayee Valley almost equal in extent to Upper Assam. I should say the present population does not exceed 1000, though I do not think it at any time exceeded 7000 or 8000 at the utmost. In the hilly or higher lands, always covered with forests, the few villages met with are invariably situated on the banks of the choungs, where, in the dry season, a scanty supply of water is alone procurable from small trickling streams, or from pools or wells in their dry beds.

"During the dry season wheeled carriages may go in any direction to the foot of the mountains, the only obstacle being the occasional steep banks of the choungs. No made or bridged roads exist in any part of the country. Even the road from Rangoon to Ava, which we pursued as far as Thounzai, is nothing more than a track by which carts pass, subject to the obstruction of choungs already alluded to; and all traffic by this road having been suspended since the commencement of the war, it is frequently lost amidst the rapid growth of vegetation."

After suggesting that good laterite material existed all the way for constructing an efficient road, although the expense of felling and clearing the trees would be heavy, McClelland stated that timber for ordinary purposes was most plentiful throughout all the forests, and he gave a list of some fifty-three species of the genera *Sapindus*, *Odina*, *Dillenia*, *Bombax*, *Nauclea*, *Bignonia*, *Sterculia*, *Lagerstroemia*, *Artocarpus*, *Terminalia*, *Grewia*, *Ficus*, *Kydia*, *Dipterocarpus*, *Pentaptera*, *Diospyros*, and so forth. Next to teak, the Superintendent considered the two species of *Pentaptera*, *glabra* and *arjuna*, to be of value, the trees presenting clean trunks of 6 to 8 feet in diameter and 50 to 80 feet high without a branch, which

would afford excellent mast pieces and spars for naval purposes, and might be tried for gun-carriages. But the timber most in demand at that day, after teak, was the pyinma (*Lagerstroemia Flos-Reginæ*) owing to its not being attacked by white ants. The Burmese gun-carriages were made of this wood, the only fault attributed to it then being its liability to shakes. This tree appeared to be coming into such general use that he advocated a duty of one rupee a log being placed upon it, the only species outside teak which in those days had a market value. Another common large tree mentioned, with a strong tough wood, was *Melicocca* (*Schleichera*) *trijuga*, from which the Burmese made their excellent solid cart wheels.

Dr. McClelland noted that the teak growing in the native forests on the lower elevations were small, but whether this was due to the fact that all large-sized trees had been removed or not he could not say; though owing to their accessibility he thought it probable that the teak in these regions never had a chance of reaching maturity. It was in the hill forests alone that the teak appeared in perfection on the hot southern and western declivities, growing on a grey stiff sandy clay in company with several species of large timber trees, which far outnumbered it in quantity. The Superintendent estimated that the proportion of teak to other species was one in five hundred. In what were called the teak forests proper the proportion was about one in three hundred; in neither case was the tree "equally diffused, but confined to certain localities of small extent where it constitutes the prevailing tree for a few hundred yards, seldom for a mile continuously. These localities are the warm southern or western slopes; sometimes it ascends to ridges, and when these are sheltered to the north and east by higher hills presenting a free south-western aspect, the teak assumes its largest and most lofty size. It must be quite obvious, however, that a tree depending on so many local peculiarities for its full development cannot occur continuously to any great or general extent, yet the quantity of teak in these forests has been, and still is, very great, although the lower forests have been heavily worked; and the best teak is now only to be had high up in the forests from which its removal will every year be attended with increased difficulty. This observation applies more particularly to the Thounzai and Oakkan, although it is more or less applicable to all the other forests. Still, from the canal-like character of the choungs and the absence of any very formidable rocky

impediments the facilities they afford for floating timber in the rainy season is very great, even from their extreme sources. But even in these remote places the resources of the forests in full-grown timber are limited, and in the Phoungyee Forest almost quite exhausted.

"In all cases where the teak has not been entirely cleared away a copious crop of young trees are rapidly advancing in all stages of growth, to the present cutting standard of 2 to 4 feet girth, and only require to be preserved until they acquire their full natural growth in order to afford a plentiful supply of valuable timber at a future period; but it will require no ordinary precautions to render the full-grown timber sufficient to meet the public demands, until the half-grown attains its full size, and yet the security and value of the forests will entirely depend on the success with which this principle is carried out."

This valuable expression of opinion indicates how quickly McClelland made himself acquainted with the condition of the forests and appreciated the dangers of over-felling and trenching on the forest capital. It was the able work and reports of his predecessors, from Wallich down to McClelland, which enabled Brandis to so rapidly grasp the position of affairs, and, armed with the authority accorded to the trained specialist, build up a sound system on the foundations already laid.

The inhabitants of the teak forests did not amount to more than two or three per twenty square miles, and McClelland expressed surprise that these people exhibited complete indifference to the timber question and did not even employ teak in the construction of their houses, "which are made entirely of bamboos, covered with the broad leaves of *Licuala*; even their occupations are altogether unconnected with an article which is the source of wealth and industry everywhere, but in the place where it is produced."

Writing of the Karen and Yaibanes, who inhabited these forests, McClelland said that the former lived by the method of shifting cultivation, termed *taungya* in Burma, whilst the latter were manufacturers of silk, cultivating the mulberry for feeding the silk worms which they reared in the hills, the latter being more suitable for the purpose than the plains. The Doctor's description of these people is rather a felicitous one. "The silk they produce appears to be of a coarse kind owing to the imperfect way in which it is wound off than to any fault of the cocoon. They are a most industrious people,

young and old of both sexes being employed without interruption, in some part of the process, which seems to require incessant attention. The cocoons seem to be large, very fine, and were produced at the rate of 2000 for one rupee, and the silk when wound off is valued at five rupees per viss (3·6 lbs.). They could give us no information about the teak forests, though living in the midst of them. A few men come up from the plains at certain seasons to cut and remove timber, but beyond this they knew nothing, and seemed to care still less about the matter. The Yaibanes are, however, a very happy and prosperous race, with the reputation of being possessed of considerable hidden wealth, which for security they bury in the forest."

The only class of natives who were interested in the timber question in the Southern Pegu Forests at the time were a few of the chief people in such large towns as Thounzai, Oakkan, Phoungyee and Pegu. These people received advances for timber from residents in Rangoon, or their agents, and deputed men to the forests with buffaloes to drag it down to the streams. The business did not form any part of the regular industry or trade of the country, inasmuch as those engaged to bring down timber were landowners and farmers, who were only tempted by the offer of large sums of money to enter into engagements at variance with their more legitimate business—the cultivation of the land. In this connection McClelland made the following remarks :—

"In a thinly peopled province like Pegu, anything that draws the attention of the inhabitants away from the cultivation of the soil must be injurious. The advance of large sums of money for the purpose of bringing down timber has this effect—it makes the landlord independent of his duty and the labourer independent of agriculture, by enabling him to obtain as much *during a few weeks' light frolicsome employment* cutting timber in the forests as would maintain him the rest of the year. I offer these observations to show that in Pegu there is no such class of foresters or professional wood-cutters, that is, persons who have been accustomed to earn their bread by forest work, or who can be thrown out of accustomed employment or be in any way injuriously affected by any alterations in the forest laws or rules."

The italics in the above sentence are the author's. The Superintendent's allusion to the cutting of timber in the Burmese Forests and its subsequent transport "as a few

weeks' light frolicsome employment" will come as a shock to Forest Officers who have been connected with this work.

McClelland visited the Thounzai, Oakkan, Maagayee, Mazalee (including the Hlaine Forest), Phoungyee and the Zamayee or Pegu Forests. The inspection showed that these forests presented several features in common, though some had been worked more extensively than others. The chief point for decision was the ownership of the timber present in them. The latter consisted of three classes : felled timber lying in the forests, killed standing timber and standing green trees, the latter being unquestionably the property of the Government. In most of the forests there were good crops of young trees ; but in all the felling of undersized trees, 4 feet 6 inches and below had been common, the proportion being on an average, for the felled trees, 8 per cent of the larger sizes as compared with 28 per cent of undersized trees—thus showing the tendency of the timber merchants of the time to remove the small timber, on the preservation of which the value and resources of the forests in the future inevitably depended. In the Pegu Forests 73 per cent of the killed trees were undersized, selected for killing in preference to full-grown timber. The returns from 15th June, 1853, to April, 1854, all showed that the traffic in timber at the time was chiefly confined to half-grown trees.

After glancing at the lines upon which the Tenasserim Forests had been managed under the licence system introduced by Maingy, the methods upon which the duties were collected and the appalling devastation which had taken place, the Superintendent alludes to the rules introduced in that Province in 1848 :—

(1) A uniform duty on all logs, whether large or small, in order to discourage the felling of undersized trees.

(2) The retention of a portion of the forests in the hands of Government, private parties being permitted to fell such trees as were marked by Forest Department officials.

McClelland appears to have based his recommendations for managing the Pegu Forests on these two rules.

He pointed out that the teak in Pegu grew in the hills, which accounted for its undoubted superiority, and that although it might be indeed difficult to remove it for this reason, yet he was of opinion that these difficulties were not insuperable, owing to the fact that these hills were everywhere

penetrated by ravines and streams, so much so that "there is scarcely a square mile from the western verge of the forests on the Hlaine to the eastern declivities towards the Sittang that is not intersected by choungs down which timber may be conveyed in the rains." For this reason he was convinced that no extent of establishment which it would be possible to employ or which he was prepared to recommend (for, owing to the climate, men could not live in the forests more than a few months in the year) would suffice to prevent illicit felling and removal of timber from the forests themselves unless a check on removals was established by a well-devised timber revenue system. He advocated that such a system should be introduced as part of the general administration of the Province. In other words, he wished to have a system of revenue stations organised on the rivers below the forests at which all the timber and other produce brought down from the forests would be inspected, measured, and the dues on it calculated and paid. This he realised was the only possible form of control open to the Superintendent, for it would enable him to exercise effective control over the cutting of undersized trees, which would otherwise be smuggled out of the forests under the plea that they were the large branches of the old trees felled. That McClelland had some good ideas upon forestry principles, which were rare at that day in India, the following evidences : "A forest may be regarded as a growing capital, the resources of which are the young trees, and unless these are preserved and guarded to maturity, it is obvious the forest must necessarily degenerate from the nature of an improving capital to that of a sinking fund, which, within a given time, must become expended. The loss occasioned by the removal of an undersized tree is not merely the difference of value as compared with a full-grown tree as a piece of timber, but must be estimated by the number of years the forest may be deprived, by its removal, of the annual distribution of its seed, which period will vary according to the stage of growth at which it was cut down, and the time it would otherwise have taken to arrive at maturity."

The Superintendent urged most strongly that the practice of felling undersized timber should be put an early stop to, instancing the Tenasserim Forests, where it took a period of twenty-one years to stay the evil, by which time the majority of the forests had been ruined. He added the apt remark : "The subject of planting has been fully treated and discussed

in the papers on teak forests as if it might be made the means of renovating extensive forests that have been once exhausted. But if we fail in the comparatively simple duty of preserving the old forests, we can scarcely hope to succeed in the more difficult task of creating new ones. Planting as a means of extension when carried on in connection with thriving forests, might, indeed, become a duty, with a view of perpetuating an object that conferred a lasting benefit on society."

The returns at Rangoon for the season 1853-4 showed that of 11,553 logs (up to 1st April, 1854), 7082 or 70 per cent of the whole were small timber, under 4 feet 6 inches in girth, upon which a duty of Rs.22 8 annas per 100 was levied, being 15 per cent on a valuation of 150 rupees per 100, or rupees 1-4 each. As the Superintendent stated it was imperatively necessary, both in the interests of the public revenue as also in the preservation of the forests, that this description of timber should no longer be admitted. The same remark applied to the loozars or short logs. The cutting of these did not contravene the felling-girth regulation, but their preparation was attended by a very great waste of timber. The same return showed that 1727 loozars (or short logs from 16 to 10 feet in length and of any girth from 4 feet 6 inches upwards) had been passed, yielding a revenue of Company's Rs.1168.8 at a 15 per cent valuation. It was not necessary to actually prohibit the introduction of such timber, but it should be made to pay the same price as the long logs in order to discourage the practice of cutting up fine long logs into these short pieces, which was done merely to cheapen the cost of extraction. The loozars and undersized logs together constituted 85 per cent of the above alluded to returns, which made it very evident that drastic steps were required to put a summary stop to this method of felling and extraction in the forests.

McClelland proposed that in future the only descriptions of timber to be recognised should be logs of 6 feet girth and upwards, of a length corresponding to what were called "Doogies," i.e. 25 to 32 feet, thus yielding as the minimum 17 to 25 tons of timber : taking the market value at Company's Rs.40 per ton, making the value of the logs Company's Rs.51.3 ; upon which at the rate of 15 per cent, the duty chargeable on each log would be Company's Rs.7.10.5. The Superintendent expressly states that this scale was based strictly on the principles of the "existing tariff," i.e. that in force in Tenasserim. Yet there was no reason why he should have based

his valuation on the Tenasserim tariff since the Pegu Forests had been notified as Government property, and there was no desire on the part of Government to give preferential rates to timber merchants to enable them to realise the profits properly belonging to Government. But McClelland himself thought his proposal might be followed by a temporary falling off in the revenue, for he remarked : " If the change should be attended with an interruption of the trade in the first instance it would be highly beneficial to it hereafter." He proposed that purchasers of timber should obtain information from the office of the Forest Department as to the nature and extent of killed and seasoned timber available in each forest, for the purchase of which sealed tenders would be invited at a nominal upset price, exclusive of duty. The holders of timber would not be entitled to any privileges, but only be permitted to remove a given number of killed trees in certain forests ; the latter to be notified by the Superintendent as soon as he had ascertained their contents and made the necessary arrangements, and would be subject to penalties for any infringement of the rules safeguarding the removal of trees other than those pointed out to them as theirs, for the cutting of the stems into short logs, or felling undersized timber. Department officials or others would be subject to the same rules, and punished for any infringement. Timber removed from other sources than the forests worked under the timber regulations would be subject to the same restrictions and duty, and a pass for its removal would have to be previously obtained. The removals from these forests, i.e. those which the Superintendent had not yet had time to thoroughly inspect, would be safeguarded by the Rules against felling undersized timber, etc.

For timber required in building and other purposes in the large towns in the interior, above the revenue stations on the rivers, an application would be made to the Deputy or Assistant Commissioner of the District, the amount required being stated. The Forest Assistant would be notified of these amounts, and would collect the duty. The latter would be responsible for seeing that the Rules were not infringed.

The Superintendent suggested that a Notification should be issued requesting all parties having claims on timber then lying on the banks of the principal rivers throughout the Province, either to remove, point out to, or register the same in the presence of, and with the aid of, a Forest Official and

file the said register in the office of the Superintendent within one month from the date of the Notification for the main rivers (Hlaine, Phoungyee and Pegu), forty days for the Tharrawaddy River, and fifty days for timber lying on the Irrawaddy and Sittang. After the expiry of these dates all unregistered timber would belong to Government.

The killed standing timber and that lying felled in the forests the Superintendent considered to belong to Government, as it appeared to have been understood from the first that the mere fact of having killed a standing tree under the sanction of the late Burmese Government conveyed no right to the tree on the part of the person killing it, and he considered that the felling of the tree thereafter by a person likewise conveyed no right to the felled timber. He proposed, therefore, to sell by auction all killed standing and felled trees found in the forests for Government. The sale of such timber in the southern forests would, McClelland estimated, alone supply the Rangoon market during the ensuing season with 13,067 logs, exclusive of the timber which would be brought in from other sources in the district. And he calculated that when the middle and northern forests had been examined, he would obtain in like manner the requisite supplies for the 1855 requirements, after which the demand would be met from the arrangements made under his proposed new rules and method of management.

The Superintendent stated that he had taken the precaution, owing to the fact that full-grown timber required to be killed (i.e. by girdling), at least two years before it is cut down (this is done to enable the timber to become light enough by loss of moisture to float), to have 800 full-sized trees killed in the Thounzai Forests, and 600 in the Oakkan Forests. It would be necessary to carry out the same work in other areas, so far as their resources permitted, without delay in order to be ready to meet the demands of 1856. The same provision would be necessary annually to meet the demands of succeeding years, and he was of opinion that it would be better to undertake the girdling and killing of the trees three years beforehand, instead of only two. McClelland rightly noted that "the value and resources of the forests will depend in no slight degree upon the care with which these annual supplies are from year to year provided and which will demand a thorough and familiar knowledge on the part of the Superintendent of the resources and conditions of every portion of

the forests throughout the Province, only to be acquired from personal observation and enquiry."

McClelland, in conclusion, commented upon the unfortunate circumstance that teak timber appeared to form almost the only object of mercantile enterprise in the Province. "The encouragement to an exclusive search and use of teak timber alone, endangered the complete annihilation of the species and caused other descriptions of timber to be entirely overlooked, which if equally well known, might be found to be scarcely less valuable. Time and necessity will in due course render these and other resources of the forest better known, as the oils, gums and textile materials ; the wood oil," he said, "had already achieved a considerable reputation."

The Superintendent wrote in a prophetic vein, but it remained for a World War to bring home the glaring conservatism of the users of timber and to make the enormous potential value of the Indian Forests (outside a few species already possessing a commercial value) apparent. And development, he considered, need not be confined to the forests alone. "The agricultural possibilities of the country were such," wrote McClelland, "that it only required a sufficient population to render it equal to Bengal itself as a rice country ; whilst the higher lands afforded rich pasture for cattle, an industry which, with the greater stability of British rule in the country, was already exhibiting a remarkable rise in prices."

McClelland's report may justly be considered the foundation upon which a Burma forest policy was surely built up. It was written several years before the first properly trained Forest Officer landed in the country, and it was the seed from which Lord Dalhousie's famous Forest Charter was promulgated. It is right that McClelland should be accorded by later generations of Forest Officers a full meed of credit for his far-sighted views.

It will now be necessary to review the manner in which the above recommendations were received.

It was unfortunate that Captain Phayre, the Commissioner of Pegu, was not the type of man capable of regarding the suggested policy with the breadth of view demanded. In his letter, dated 24th July, 1854, to the Secretary to the Government of India, forwarding McClelland's Report, Phayre agreed with the Superintendent's proposals for prohibiting the felling of undersized timber, and his suggestions for collecting the duty on the timber ; but, basing his reasons entirely on the

royalty levied on timber in the Tenasserim Province, he considered the Superintendent's suggested price of nearly Rs.8 per log far too high, expressing the opinion that timber from Pegu should not pay a higher royalty than that in force in Tenasserim ; he, therefore, reduced the suggested Rs.8 a log to Rs.4. " I consider," remarked Phayre, " the principle of Dr. McClelland's plan, that, namely, of preserving the forests by means of rates of duty on timber so high, as to render the working of them profitless, or barely remunerative, as being essentially wrong ; I could not, therefore, in any case recommend its adoption."

Phayre put in force, subject to the approval of the Governor-General in Council, the following Rules :—

- 1st. Timber under 5 feet girth will be confiscated.
- 2nd. All timber of any length, of and above 5 feet girth, to pay (for the present) a duty of Rs.4 a log.
- 3rd. Crooks, the produce of branches (this limitation is meant to prevent small trees being cut for this description of timber), to pay the same rates as exist at Moulmein.
- 4th. Foreign timber coming down the Irrawaddy and Sittang Rivers, to pay on the frontier 15 per cent of the value of the cubic contents to be calculated at Rs.14 a ton, a similar rate to that levied at Moulmein.

He agreed with the Notification drawn up by McClelland, already alluded to above, under which the extraction work in the forests was to be undertaken. He noted that the latter had made no reference to planting work, but added that the Superintendent said he required more experience of the forests before making recommendations on this head.

The rather careless manner in which the Commissioner had drawn up this covering letter to McClelland's Report perhaps riveted the attention of the Governor-General to the matter of the forest policy to be instituted in the new Pegu Province to a greater degree than might have been the case had the subject been dealt with by an abler man than Phayre. However that may be, the answering letter of the Secretary to the Government of India, dated Fort William, 3rd August, 1855, communicating Lord Dalhousie's famous Minute on a future Forest Policy, which has been alluded to above as the Charter of the Indian Forests, left in no doubt the views of the Governor-General on the Pegu Forests question, and his opinion of the Commissioner's ideas on the sub-

ject. The Secretary, Mr. C. Beadon, wrote to the Commissioner :—

" Having given the subject treated of in these papers his best consideration, His Honour in Council desires me now to observe in reply, that the Report of the Superintendent affords much valuable information, and contains many useful recommendations, but the system proposed to be adopted is so imperfectly described in your letter, that His Honour in Council has found it somewhat difficult to understand exactly what it is proposed to do. The two distinct elements of duty and price are so mixed up together, that His Honour in Council cannot but suspect that both Dr. McClelland and yourself have not seen the full force of the principle which was laid down by Government at the annexation as the ruling principle of the whole subject, namely, that the teak timber should be retained as State property.

" Your letter, His Honour in Council observes, does not explain the whole case. It would be inferred from it, that there was but one class of timber in question, which is intended to be treated all in the same manner. But a perusal of the voluminous papers enclosed has shown that there are three classes of timber : *first*, timber cut and lying at places outside the forests, that is to say, timber which had become private property at the time of annexation, but had not yet been brought all the way to market ; *secondly*, timber cut or killed, but still in the forest, which is public property, and from which the wants of the market are first to be supplied ; *thirdly*, growing timber.

" The Rules, dated 6th July, 1854, which you have put into operation, subject to confirmation, apply only to timber of the first class, which is private property, and for which it is quite right to charge not a *price*, but a duty. With these Rules His Honour in Council will not interfere, as the timber to which they are applicable is now probably exhausted ; but I am desired to request that, if you see no reason to the contrary, they may be cancelled, now that they have been more than a year in force, and that a notice may be issued to the effect, that all timber hereafter found between the forests and the revenue stations without a pass will be seized as public property.

" The Rules under which timber of the second and third classes is to be purchased, and paid for, and floated to market can only be found by reference to Dr. McClelland's proposed

Notification and by a comparison with other Memoranda by yourself. A certain other Notification and a 'new tariff' alluded to are not with the papers submitted." The Governor-General commented adversely on the suggested levy of a "duty" and "price" for logs which the proposed system involved, stating that "it will be, in fact, taking one thing under two names." He also noticed that no estimate had been given of the average cost of taking the timber to the market. On this subject the Memorandum reads : "This is the most important element in the calculation to be made ; for, of course, the difference between this cost and the market price is the value of the wood as it stands in the forest ; I am, therefore, directed to draw your attention to the consideration, that Rules which, like the Moulmein Rules, were framed for the imposition of a 'duty' upon native and foreign timber, chiefly private property, can hardly be applicable to timber which is wholly the property of the State, and which it has been determined shall be made saleable for a price which is to include all duty, in other words, which is to free it from all liability to duty.

"The plan which you propose to introduce as a permanent arrangement, as far as can be gathered from the numerous papers that had to be referred to, is for the Superintendent of Forests annually to mark and kill (by ringing) the trees which are to be felled the next year in each Forest. No other trees are to be felled. The right to bring the whole of the marked trees of any one Forest from the Forest to market is to be annually sold 'to *approved* purchasers,' who are to tender for the same beforehand. A minimum price of Rupees 6 a log, without regard to the size of the logs, is to be insisted upon. One-third of this price is to be paid immediately, and another third is to be paid before the timber can get to market. When these 'approved' purchasers bring down their logs, they are to stop at certain Revenue stations, where they are to pay a duty of Rupees 3 a log, also without regard to size. For mast pieces this duty is to be paid over and above the price ; for spars and common logs this duty is to be allowed for in the price.

"This appears to the President in Council a cumbrous system, and one which at the same time is not likely to give the public treasury the full value of the public property sold, or to ensure those traders a supply of timber who want it most, unless they happen to be great capitalists and specula-

tors in timber. The persons at Rangoon, who procure timber from the Forests, do not go to the Forests themselves and cut the timber, or drag it to the water, or float it to market, by men hired by themselves. They enter into contracts for all this work with some of a particular class of people, who make it their business to labour in this manner. There seems no reason why the Superintendent of Forests, after marking and killing the trees to be felled, should not make similar contracts with the same people, give to each contractor a pass for the number of trees he contracts for, and so collect the timber at the Rangoon market, and there sell it, not to a few *approved* purchasers, but in moderate lots, to the highest bidder, at periodical public auctions. This method, His Honour in Council believes, would prevent sub-monopolies and collusion between a few capitalists, for there will be few merchants in Rangoon able to buy in advance the whole annual crop of a large Forest. It will ensure the Rangoon timber market (a subject of great complaint at present) being a free and open market to all, without favour to any ; it will also make the smuggling of stolen or undersized timber easy of prevention ; for the only people allowed to cut in the Forest will have no interest in cutting more than they contract for.

"A perusal of paras. 31, 32 and 33 of Dr. McClelland's Report has satisfied His Honour in Council that the only way to prevent the appropriation of trees without paying for them, and to prevent the destruction of undersized and half-grown timber, without wasting the branches of large felled trees (under which name, if allowed, the stems of young trees might be passed), is not to allow a purchaser to enter the Forest, or to have any concern in felling the wood or bringing it away. The only check provided by the proposed system, for the prevention of the practice of appropriating timber without paying for it, is the charge of a so-called duty of so much a log to be levied at certain stations on the river ; but it is clear that this will not prevent the felling of unmarked trees, and the appropriation of the timber, without paying the full price for it.

"With advertence to the question of the rate of 'duty,' upon which there is a difference of opinion between Dr. McClelland and yourself, His Honour in Council has a few remarks to offer. You reduce the rates proposed by Dr. McClelland by one-half, on the ground, that at such high rates, the Forests could not be worked at a profit, and that such charges

on timber would destroy Rangoon as a shipbuilding port. You, however, adduce no proof in support of this assertion. At first sight, it seems not very probable, that the Superintendent of Forests would propose a rate of duty so high as to make the produce of his Forests valueless : and from what is known of the high market value of Teak timber at Rangoon, it is difficult to imagine it possible, that a duty of Rupees 8 on a tree of five feet girth and upwards, which is estimated as equal to 15%, *ad valorem*, would operate as a prohibitory tax. It is understood that Teak sells readily at Rangoon, for from Rupees 40 to Rupees 50 a ton, and the average measurement of trees of such a girth as five feet must be very great. The value of a spar is estimated at Rupees 75, and that of a log at Rupees 51 or 52. Although His Honour in Council cannot think that Dr. McClelland's rate of duty would have the supposed effect, yet he admits that an excessive rate of duty would have that effect. The plan of auction sale which has been alluded to could not possibly have that effect, and herein such a plan has a manifest advantage over any system of fixed duty or fixed price. The timber at auction will sell for what it is worth, but no more ; and though it were given away by Government to an 'approved purchaser' at only a nominal fixed price or duty, the shipowner would have to pay for his ship according to the actual worth of the timber in it, not according to what the Government may have got for that timber. In fact, it is the price that the shipowner will give for the ship, and the necessary limit to the annual supply of timber, that will regulate the actual worth of the timber ; and any difference between that amount and the prime cost will be the profit, neither of the purchasers, nor of the builders (as such) of ships, but of the timber speculators only. The excessive profit of these speculators at Moulmein has had indirectly a very bad effect upon the progress of the Tenasserim Provinces, for it has attracted the capital and energies of the whole mercantile community there to this one speculation only."

We have here enunciated for the first time in the history of the Forests of India a clear-cut policy on the subject of the future management of the Government Forest Estate, and the views thus laid down by a Governor-General were destined to provide Mr. Brandis, on his arrival in India, with a definite foundation on which to build up the great conservancy system which ultimately came into force.

McClelland wrote a second Report on his inspection of the forests lying to the north of those visited previously on the feeders of the Hlaine, Phoungyee and Pegu streams. The northern forests were situated on the main ridge and spurs of the Yoma, a chain of hills which divides the waters of the Irrawaddy and Sittang Rivers. A portion of the forests east of the Sittang was also visited. The forests west of the Irrawaddy on the spurs of the Arakan Mountains were not visited.

The Commissioner's letter and remarks forwarding the second Report to the Government of India are dated August 4th, 1855, whereas the Government of India's Minute, quoted above, is dated August 3rd, 1855. Consequently some of the observations in the Superintendent's Report and others in the Commissioner's covering letter had already been dealt with in the Minute, which had not been received at the time in Pegu.

It becomes obvious, however, from both Report and covering letter and other correspondence which had passed between the Superintendent and the Commissioner, that the two held very divergent views on questions affecting the forest administration and policy of very considerable importance. It is equally apparent that on main principles the Government of India sided with McClelland. But more than a year elapsed before this vindication of the latter's opinions reached the Commissioner, as expressed in the Forest Charter. During the year relations became more strained, and after submitting his second Report McClelland resigned the appointment of Superintendent and went home on furlough.

There can be little doubt that for the period to which the history of the forests in India had attained, McClelland had the makings of a good Forest Officer in him, and his loss would have been a severe one had not his post been filled so shortly after by Mr. Dietrich Brandis.

A brief notice of McClelland's second Report will be of interest to render the narrative complete.

After dealing with the physical geography of the country, the localities of the several teak forests, the trees associated with the teak, of which he included a botanical list as an appendix to the Report, and so forth, the Superintendent discussed the question which, as has been shown, proved so difficult in the Tenasserim Forests, of the efficient protection of the young teak trees in the forests from destructive agencies,

and the extension of the forests by planting. McClelland was of opinion that the expense of planting and protecting young trees—he made no allusion to the necessity for properly thinning the plantations, which would require an adequate trained staff—would be greater than the value of the timber to be derived from such a system, whilst the risk of loss from various causes would be considerable. There was no want of natural seedlings in the forests, and he recommended that a portion of these young trees should be transplanted to suitable adjoining localities. This, he said, could be effected by means of a small number of labourers being employed temporarily for a few weeks of each year, under the existing establishment. He also recommended, and the Commissioner supported the recommendation, that rewards should be paid to the subordinate forest officials who kept their forests in the best order and carried out the largest extensions, a suggestion of somewhat doubtful value when it is remembered that the whole staff was entirely untrained.

The Superintendent also drew attention to the damage done by fires and to the pernicious effects of the *toungya* cultivation, practised in forest areas by the Karens and Burmans. He strongly recommended that the Burmans at least, who were really natives of the low country, should be prohibited from carrying on this form of cultivation, and should be made to settle in the plains and practise a more settled form of agriculture. The Commissioner considered that this proposal would entail a great hardship on these people, that "to tell them to change their mode of life with their country, to descend to the plains and cultivate paddy (rice) land, without ploughs and without bullocks, would be a cruel mockery." The Commissioner does not appear to have realised that the first efforts of a stable and civilised Government should have been to endeavour to raise and ameliorate the condition of the people by inducing them to undertake a more settled and stable manner of life.

A difference of opinion had arisen between the Superintendent and the Commissioner as to the ownership of felled timber lying in the forests. The former contended that this timber belonged to Government. He was overruled, however, by the Commissioner, who maintained that all timber felled in the forests, but not extracted at the time of the annexation, belonged to the private individuals under whose orders it had been felled, in spite of the fact that it was known that the

actual purchasers of the timber never went into the forests themselves, and consequently never actually paid for the timber until it had been brought out of the forests. As has been shown, the Governor-General's Minute, dated the day before the Commissioner wrote the above letter on the Superintendent's second Report, definitely disposed of the Phayre's contentions. But the Commissioner's order to McClelland that this timber should be allowed to be taken out of the forest resulted in a considerable loss of public revenue before the receipt of the Governor-General's decision in the matter.

McClelland resigned in the middle of 1855, just when he might have hoped, with the ruling of the Governor-General directly against the spirit in which the Commissioner was endeavouring to initiate his own ideas of a forest policy, to have been able to make some considerable progress. Dr. Brandis was appointed as Superintendent of Forests in Pegu in January, 1856, the Forests of Tenasserim and Martaban being placed under his charge in the following year. He commenced the great task which lay before him by working on the lines his predecessor had suggested. Possessed of considerable force of character and a sound judgment based on a thorough scientific training in Forestry—being the first fully qualified Forest Officer appointed in the Indian Empire—Brandis laid, in the face of strenuous opposition from the European and Native timber merchants, the foundations of the Forest Department in Burma; and ultimately of the Forest Service in India.

In the autumn of 1856 new Rules were drawn up and published in January, 1857, to bring the Pegu Forests under regular conservancy, and for preventing their destruction by the removal of all the mature, marketable, seed-bearing trees, while a rough working plan was framed for regulating the killing and felling of teak for extraction. Brandis obtained a preliminary enumeration of the number of teak trees in the forests by his now famous linear valuation surveys, etc. These operations will be more fully described in the next period, which covers Brandis' work in Burma before his translation to India and the Inspector-Generalship of Forests.

CHAPTER XV

FOREST OPERATIONS IN THE PUNJAB, WESTERN HIMALAYA AND SIND, 1850-1857

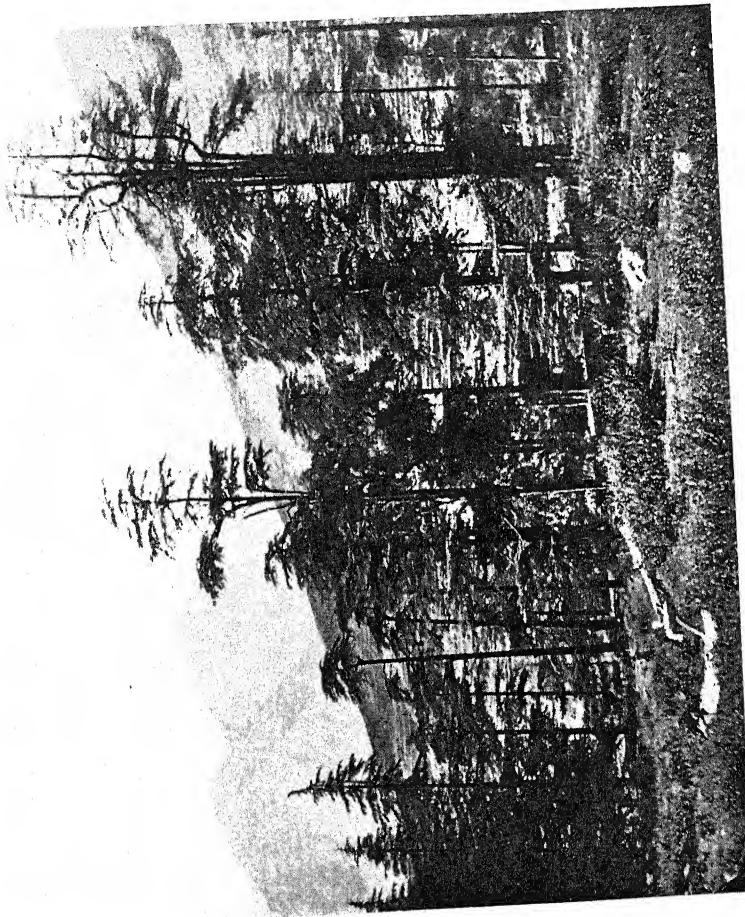
WITH the development in the construction of public buildings, and to a less extent communications, which set in in the Punjab in the middle of the century after the annexation of the Province, a dearth of the necessary timber soon made itself felt. Deodar was the wood chiefly in use and required.

In 1851 the Governor-General, Lord Dalhousie, appointed Captain Longden, H.M. 10th Foot, to carefully explore and report on the forests of the whole of the Western Himalayan Range from Chamba eastwards to the north of Simla. This duty was carried out in 1852-3 with great energy and remarkable judgment. Captain Longden was a man of exceptional physique and powers of endurance, and in the performance of this work he penetrated into regions of the Himalaya, which had been previously visited by but few Europeans. His Report, though brief in its contents, was a highly useful document, affording data on the forests of the regions which proved extremely valuable.

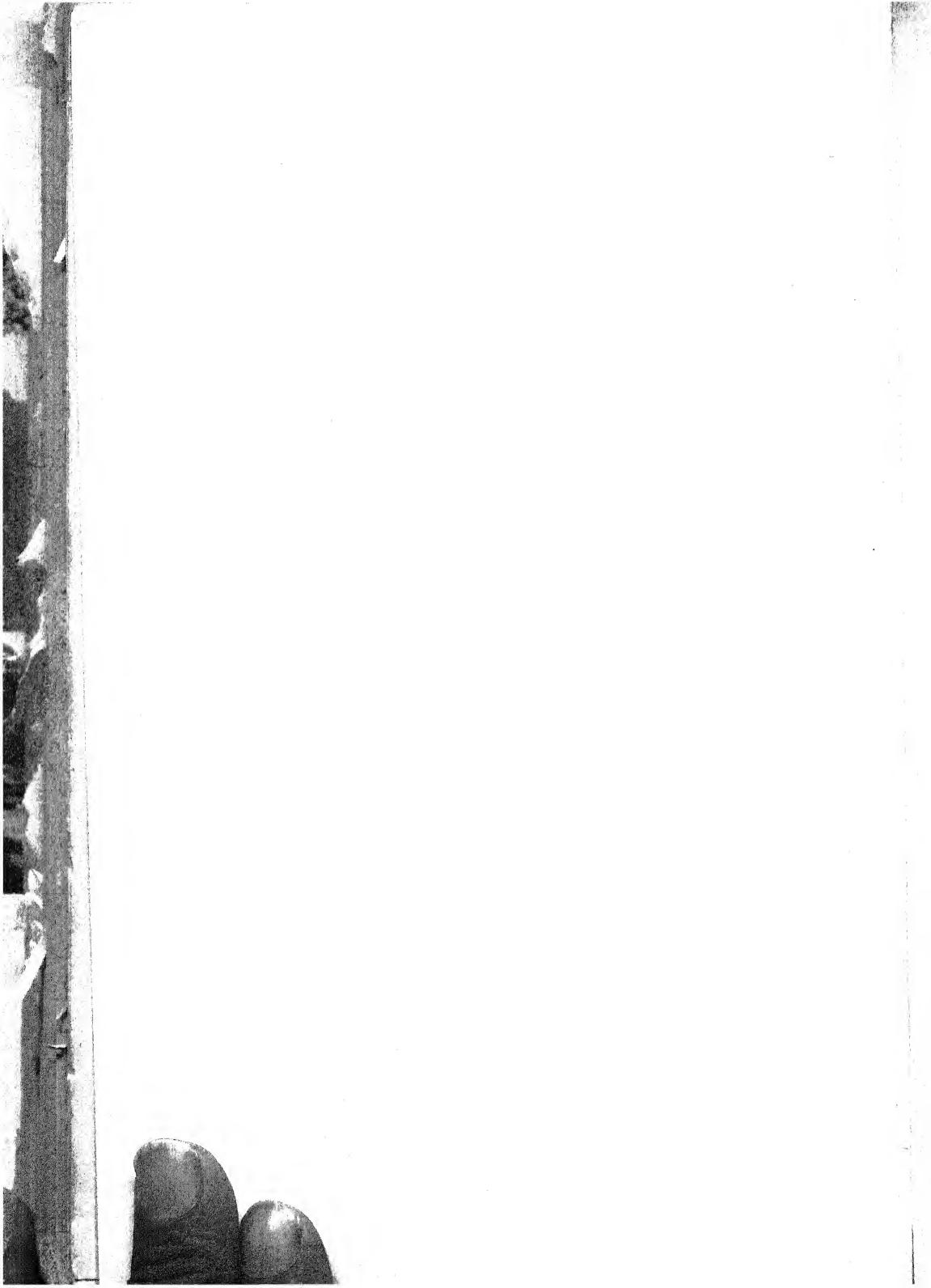
As an outcome of his investigations, after inspecting the forests of the territories bordering on the Sutlej, Beas, Ravi and Chenab Rivers, he recommended the establishment of an Agency on the Chenab, and the dépôt formed near Sealkote was destined to supply the principal Public Works of the Punjab with the timber they required during the next twelve years.

Longden also prepared some good Forest Charts of Mandi, Sukhet and Kulu.

Previous to Longden's deputation on this work, Mr. E. Prinsep, C.S., at the time Assistant Commissioner of Sealkote, visited the Padar and Kishtawar districts to inspect the deodar forests in the Maharaja Golab Singh's territories (Kashmir), and effect arrangements for the supply of materials



DEODAR FOREST, N.W. HIMALAYA
From India Office Album



required for building the Sealkote Cantonment. He ascended the valley of the Chenab from Akmur to near the Chamba boundary, and part of the valley of the Butna, a large tributary. It is recorded by Colonel Harley Maxwell, then Executive Engineer, "that his labours were attended with the greatest success." Deodar wood was supplied from Padar and Kish-tawar, and the Maharaja Golab Singh consented to forgo duties on timber passing through his jurisdiction, but felled within British territory.

Longden first visited the valley of the Beas River.¹ He reported some few patches of deodar existing on the hills, but the tree was far from abundant. In the previous year (1851) Mr. Barnes, the Deputy Commissioner, had given it as his opinion that deodar to the value of more than Rs. 5000 per annum could not be supplied from Kulu. In the Manoli Forest, extending in a strip on the right bank of the river, Longden estimated the number of trees above 3 feet in girth at 4000 ; the finest clump being on the right bank round the temple (Horma), containing 1500 trees, 8 to 10 feet in girth. In 1848 Mr. T. Arratoon, a contractor, had felled some fine trees in this forest ; and subsequently four native timber merchants felled a considerable number in the Burwa Plain.

Cunningham, in *Jour. As. Soc., Bengal*, mentions that at Burwa there was "a forest of noble cedars," the girth of many being fully 8 feet.

On the Parbati, a tributary of the Beas, Longden found some patches of deodar in the valley, chiefly at Jerri and Uchich. These were adjacent to the stream, and had been partly felled. The forest, though limited in extent, appeared to him suitable for conservancy, and resembled generally the Manoli Forest. Felling was shortly afterwards undertaken here, and official correspondence relates that 350 deodar logs were cut by a native contractor near Jerri and made over to a Government official there ; one of these logs was 23 feet in length, thus indicating what the forest was capable of producing at this time and also the capacity of the stream for floating purposes. Longden then inspected the Sainj Valley above Larji, but found little deodar in it. The Ul, a large tributary of the Beas, separates near its source Chota and Bara Banghal ; a small forest of deodar was found in Chota Banghal, near the village of Tramar (Tramahar), the

¹ The valleys of the five Punjab rivers and their tributaries are described in greater detail in Chapter XXII.

site of which appeared suitable for the growth of the tree. Some forests were also discovered by Longden in 1853 in Bara Banghal, which is in British territory. Here he found a native contractor carrying out illicit fellings which he promptly stopped.

As showing the opinions which had prevailed previously to this period amongst officials on the subject of conserving the forests, the following extracts from Mr. Barnes', C.S., Settlement Report of Kangra merit a notice.

"Extensive wastes and forests are usually considered the undivided property of Government. But even here there are subordinate tenures which cannot be overlooked. There are certain castes in the Hills, such as 'goojurs' and 'guddis' who cultivate little, and keep herds of buffaloes, and flocks of sheep and goats. Such classes have a claim upon certain beats of the forest which they regard as their 'warisee,' subject to the payment of pasturage tolls. The forests of the lower Hills are apportioned out among the *guddis*, or shepherds, of the Snowy Range, who, in the winter season, bring down their flocks to graze. In the same manner the *goojurs*, with their buffaloes, will take up divisions on the hill-side, and carefully respect their mutual boundaries. Not unfrequently, as buffaloes rejoice in different shrubs and grasses from those which sheep and goats affect, a *guddi* and a *goajar* will possess a concurrent claim upon a certain tract of forest. Either would instantly resent the intrusion of another of the same tribe, bringing the same class of animals to graze; but as their respective herds delight in different esculent matter, the rights of the two are perfectly compatible.

"In the time of the Rajas, the forests were strictly preserved, for gamekeepers (*Rakha*) were entertained to patrol the bounds and prevent the intrusion of the profane. Once a year the Raja would order a grand battue. The people were collected as bearers, and matchlockmen were posted on every tree. The Raja himself would have a place prepared at some eligible break. Then would commence the business of the day. The beaters, led on by drums and fifes and all sorts of discordant instruments, drove the game towards the shooters, and the forest would resound with a constant succession of shots. The slaughtered victims, chiefly wild pigs, would be collected in heaps, and rare was the battue, when no injury occurred to the beaters.

"These preserves are still kept up in the jageer estates of

their descendants. But in the Government lands the people on our accession broke loose, and for the first three years could not be restrained from reckless devastation of the timber. Now again there has been a reaction, and the people have framed laws for mutual observance, with the express object of maintaining the forests. Everyone may gather fuel, but he may not cut green wood, and for building purposes he can fell timber on the issue of an order from the headman of the village."

The views so expressed were not always in accordance with the principles of forest conservancy, as is evinced by the Rules drawn up by Mr. E. C. Bayley in 1858, and amended by Colonel Lake. These Rules were sanctioned by the Punjab Government on 25 January, 1859.

The following were the revised Rules for the preservation of timber in the Government Forests of the Kangra district :

(1) No tree of any kind available for building or other purposes of timber to be felled of a less diameter than one foot, except with special permission.

(2) No tree of the above description, whatever may be its size, is to be felled for purposes of fuel, except with special permission.

(3) No tree, of any size or description whatever, is to be felled within 100 yards on either side of any public road or way, except with special permission.

(4) No tree of any kind whatever to be felled without permission.

(5) This permission will be granted on application through the Tehseeldar subordinate district official, who will forward it for sanction to the district authority; but for the inferior kinds of trees required *bona fide* for agricultural or domestic purposes, the permission of the headman will suffice.

(6) The Tehseeldar will state, in forwarding the application, whether the applicant is entitled or not to cut timber; and if he be entitled, whether the application made is duly proportioned to his wants. All applications should be in a printed form.

(7) Proprietors of land, or hereditary cultivators, are entitled to cut and appropriate whatever timber they may require, for building or agricultural purposes, on paying a fee of four annas; and trees unfit for timber, as fuel, or their leaves as fodder, gratis.

(8) The Deputy Commissioner may, if he sees reason, grant timber (on a limited scale) to others for special purposes, not being for sale, either gratis or on favourable terms; and to soldiers in the ranks of our army on the same terms as proprietors of land.

(9) Every application shall specifically state the name, caste, father's name, and residence of the applicant; and the number

and kind of trees, the object for which, and the forest from which they are required ; a printed form of application to be used.

(10) Persons buying timber, are required to deposit, on the grant of their application, the full value of the timber to be cut, or to give satisfactory security for the payment of the same, without reference to the quantity the cutter may be able to remove.

(11) When an application is sanctioned, the Tehseeldar shall issue an order (specifically worded as the original application) to the Lumberdar (headman) of the village within which the forest is situated.

(12) This order shall continue in force for four months only from its date. If the wood be not cut and removed within that period, the order shall be of no further validity, and any wood cut and the price of any portion not cut, shall be forfeited to Government.

(13) The Lumberdar, to whom the order is addressed, and all village officials in general, shall be responsible that its conditions be duly fulfilled. On receipt of the order the Lumberdar shall point out to the grantee the limit within which he is entitled to cut.

(14) Any person having a grant, who shall cut trees except within the boundaries of the forest specified in the grant, or who shall cut trees of a kind not specified in his grant, or in excess of the number, or for a purpose other than that specified in his grant, shall be liable to a fine not exceeding 100 rupees, and trees so illegally cut shall be forfeited to Government. Half the amount of the fine levied shall invariably be given to informers.

(15) Any person cutting a tree within 100 yards of any public road or way, or cutting a tree fit for timber of less diameter than one foot, or any such tree, of any size whatever, for fuel shall be liable to a fine of 10 rupees for each tree so illegally cut, half the fine being payable to the informer, provided that the total amount of fine shall not exceed 100 rupees.

(16) Any person cutting any tree whatever without permission, to be liable to a penalty of 30 rupees, for each tree so cut, half the fine being payable to informer ; provided that the total amount of fine shall not exceed 100 rupees.

(17) Any Lumberdar, to whom a grant to cut wood may be directed, failing to point out the forest specified, and its boundaries to grantee, or neglecting to report any breach of the conditions of such grant, to be liable to a fine of 25 rupees.

(18) Any Lumberdar willfully conniving at any breach of these regulations, or himself violating them, to be liable to a fine not exceeding 100 rupees, or in aggravated cases to dismissal from his office.

(19) Persons having an ancient right to graze, gather dry wood, or to collect leaves for manure, in any Government forest, are, with the undermentioned restrictions, still entitled to these rights.

(20) In order to promote the growth of seedlings, both for timber and fuel, the third part of every Government forest shall be preserved for three consecutive years, or for such periods as the local authorities may determine.

No one shall set fire to grass within the Government forests, and grazing in the preserved portion shall be prohibited altogether for such periods as the local authorities may determine ; no tree shall be cut in any preserve for fuel, nor any leaves collected for fodder, at any time of the year.

(21) Any person violating these restrictions to be liable to a fine not exceeding 50 rupees.

(22) Any person not being permitted to cut wood, who shall on any pretext take a cutting instrument into a Government forest, or any person whatever who shall take a cutting instrument into any portion of a forest preserved under Rule 20, shall forfeit the instrument.

(23) Any person refusing to give up such instrument, to be liable to a fine not exceeding 20 rupees.

(24) Any person wilfully injuring or destroying trees planted on the roads, or for any public purpose, shall be liable to a fine of 20 rupees for each tree, provided that the total amount of fine shall not exceed 100 rupees.

(25) The boundaries of each Government forest shall be marked out, either with a ditch or boundary pillars. A sufficiency of land for the requirements of the zemindars for fuel and grazing shall be excluded, and the remainder divided into three lots, two only of which shall be open for grazing and cutting during the year. Twice a year, on the 1st September and on the 1st March, the Putwaree should report regarding each forest preserve ; whether during the previous six months it has escaped conflagration as well as injury from the grazing of cattle, and what is the general state of the forest, and particularly of the young trees in it.

(26) Each forest shall be visited by a Government official, of not less rank than a Thannadar, once every three years, and he shall then blaze all trees fit for cutting, sufficient for the average demand of the three following years. No tree shall be cut that has not been blazed, under any pretence. The receipt from the sale of timber shall be thus divided :

	annas
Net Revenue to Government, per rupee	$5\frac{1}{2}$
Forest Conservancy Fund	$6\frac{2}{3}$
Perquisites (villager's), viz. Forests, 1 anna, Village Community, 1 anna, Putwaree, $\frac{1}{2}$ anna, Lumberdar, $1\frac{1}{2}$ annas	4

(27) The keepers of closed forests shall receive during the time the forest is closed, the average amount they would probably have received had the forest remained open.

(28) Prizes shall be awarded according to the annexed scale for deodar planted in localities where it was formerly unknown, and seeds of this tree shall be gratuitously distributed each year to the forest keepers by the Deputy Commissioner.

For the first twenty Deodars raised above 5 feet	Rs. 5 0 0
Ditto, 50 feet	10 0 0
Ditto, 100 feet	20 0 0

(29) Charcoal burners shall be allowed to remove one load per diem of wood and charcoal, on their taking out an annual licence at the cost of one rupee, but this rule only applies to those who sell wood or charcoal in neighbouring towns or markets. Licences will be granted by the Tehseeldar.

It would have saved an infinity of trouble, however, if the just rights of Government to the forest land had been distinctly declared by Barnes in the Settlement Records. The failure to do so was only partially retrieved in the future by compromise.

Longden visited the valley of the Ravi River in Chamba in 1851, and reported that 5000 deodar might be obtained annually from the forests of the Seuel Valley, a tributary stream of the Ravi. Chamba, the prettily situated capital of the State of that name, was already a city of some size and historic importance before this date; since Forster (*Journey*, I, 282, 1783) describes Chamba as "a mart of the first note in this part of the country."

Longden then visited the Pangi Forests and reported favourably on them. The forests of the Chenab first came to be extensively worked for the supply of British requirements when the cantonment of Sealkote began to be built in 1850. It was the resultant demand for timber which led to Longden's deputation to explore the hill forests, and to the subsequent establishment, as will be shown, of the Pangi Timber Agency.

In the Shor district of the Chenab, where Longden spent some time in 1853, he made a small plantation of deodar on the river bank between Rai and Sunch of some 1500 to 2000 trees.

About 200 miles of the Chenab passes through the territories of the Maharajah of Kashmir. This length of the river was unknown at the period. Longden followed the course from Pangi down to Sealkote, but unfortunately left no account of his journey. Brief notices of this tract had been given in

Thomson's and Vigne's Travels published in earlier days, but these notes formed the only information extant.

Longden explored the district of Mandi in the Sutlej Valley in 1854, and reported that deodar forests were few; he particularly mentioned some very fine trees near Shikaree, the principal peak of the range, but these were so distant as to be inaccessible.

On the Upper Sutlej the forests belonged to the Rajah of Bushahr. At this period a bag of rupees secured a permit to fell a forest tract, containing an indefinite number of trees. This was the method on which Mr. T. Arratoon and many native timber contractors had been carrying on their operations for some years, and fine deodar forests were being utterly destroyed.

For some considerable period the smelting of iron had been carried out at Shil, Kotkai, Mandi, Bir and elsewhere, a quantity of wood fuel being used in the process. The spurs of the outer Himalaya contained ferruginous deposits in abundance, and mines were being worked along the whole range both on the north and south faces, from the Sutlej to the Ravi. Under the Sikh rule this iron was extensively used for gun-barrels. The importance of these mines induced Sir John Lawrence, Chief Commissioner of the Punjab, to appoint a Committee in 1856 to report upon them. This Committee visited twelve iron mines, two of salt, one of lead and one of copper, and their Report, which unfortunately space prevents a review of here, is of very considerable interest. The Committee noted that the native processes of smelting were unsatisfactory, and the expenditure of fuel was extravagant. For instance, at Bir it was calculated that for the production of one ton of crude iron some twenty-eight fine trees had to be sacrificed; while to purify this ton of iron an expenditure still more considerable had to be incurred. The estimated out-turn of iron at Bir was 100 tons per annum. To produce this amount the Committee calculated that the charcoal used would be equal in amount to the produce of 2800 trees!

Some attention had been paid to the question of extracting timber from the Kaghan Forests, which were of large extent, situated in the valley of that name on the Nainsukh or Kunihar River, a tributary of the Jhelum. A path along the bank of this river was made by Colonel James Abbott. The earliest record of these operations is an order, 8th March, 1852, by

the Board of Administration, to Colonel Abbott, then Deputy Commissioner of Hazara, directing him to use his best endeavours to get timber down the Kunihar (or Nainsukh) River to Jhelum. In reply he mentioned the following difficulties, viz. "that Kaghan had no *thanna* (police station), whereby the floatage of the timber could be supervised; the glen was under the tyranny of the Syeds, whose oppression he had not been able to bridle. It would be difficult to ensure the payment of the labourers (*gujars*) employed to fell the trees. All recompense would be divided between the Syeds and Pathans. He recommended an Agent being sent to Garhi to purchase the logs, and said he would try to bring the wood-cutters down to receive their dues."

Colonel Becher made the first experiment in 1855-6; there is no report of the result, but allusions in records state that it is believed to have been unsatisfactory.

To the initiation of Lord Dalhousie we owe the magnificent conception which planned and commenced the construction of the great Hindustan-Tibet road running north from Simla to Central Asia and the Chinese boundary, which was commenced in 1850. The road was begun under the superintendence of Major Kennedy, and afterwards continued under Captain D. Briggs. The original plan contemplated that the road should be available for wheeled traffic throughout. But this idea was abandoned.

The tools used for this work were manufactured at Shil, where iron smelting had long been practised, under the supervision of Briggs. In connection with this work a deodar forest in the neighbourhood was purchased by Government, and felled to provide some of the timber required.

At the end of his work of investigation of the forests of the Beas, Ravi, Chenab and Sutlej, Longden recommended the establishment of an agency on the Chenab, the recommendation being sanctioned in March, 1854, when he was appointed Agent.

The following reasons probably influenced him in his recommendations. We had been endeavouring to make satisfactory arrangements to obtain timber from the Chamba State without, so far, much success; as the history of the attempts given in a letter from the Chief Commissioner to the Government of India, dated 31st January, 1854, fully evidences:

In 1851 the Wazir of Chamba agreed to supply any amount

of wood at Shahpur on six months' notice, at $3\frac{1}{2}$ tussoos per rupee. At the same time Major Longden was appointed Agent to receive the timber, to examine the forests of Chamba, and to see the agreement fulfilled. The result of this arrangement, to use Sir John Lawrence's words, was "a lamentable failure. The Chamba authorities not only did not fulfil the agreement, but evaded it altogether; not a timber was felled. We received only what was cut down in former years, and a large proportion was decayed and worm-eaten." The Wazir was pledged to furnish Government with 10,000 logs annually, i.e. 850 per mensem; but 320, or little more than one-third the number promised, were delivered at Shahpur, and "this including a very large proportion of inferior timber." With the sanction of the Government of India the Shahpur Agency was abolished in 1854. The Annual Reports of the Director of Canals and other engineering officers showed that public works were often at a standstill from want of wood, and this for a succession of years. The supply was very inadequate and of a worthless description. The dépôt of the new Agency to which Longden was appointed was established on the Chenab near Sealkote, and he commenced work in the lower part of the valley near Darwas, and made his headquarters at Kilar, being dependent on the Rajah for labour and supplies. After conducting operations for two years in Pangi he was succeeded by Lieutenant Peyton in 1856.

The following is a record of the trees felled and extracted from the Pangi district between 1853 and the Mutiny year, 1857:

1853.	Mr. Arratoon, private contractor	5034	trees.
1854.	Mr. Arratoon (to 21st June)	938	"
1854.	Major Longden (Government Agency)	5477	"
1855.	Major Longden " "	2837	"
1856.	Lieutenant Peyton " "	1873	"
1857.	Mutiny	Nil.	

These were all first-class trees.

With the selection of Murree as a hill station, or sanatarium as it was termed in those days, and with the considerable requirements in timber and fuel of Rawal Pindi and district, the question of instituting some degree of forest conservancy in the Murree Hills began to receive consideration in the early years of the period under review. The forests clothing these hills consisted of the deodar, *Pinus excelsa*, or blue pine,

the spruce and *Pinus longifolia*; with three oaks, maple, two elms, horse-chestnut, poplar, willow, wild pear and bird-cherry.

Dr. Fleming had traversed the range as a geological surveyor in 1851, and enumerated the principal trees in a paper published in the *Proc. Agri. Hor. Soc., Punjab*; and Dr. A. Gordon had recorded Notes on the Topography of Murree in the *Journal of the Asiatic Soc. of Bengal* (xxiii. 461).

Some knowledge, therefore, was available on which to base a system of Rules for the working of the forests, and such were drawn up by Major J. G. Cracroft, Deputy Commissioner, Rawal Pindi District, and published on 24th December, 1856. The Rules were entitled, "Rules for the Conservancy of Trees and Brushwood in the Rawal Pindi District," and were as follows :—

(1) In the mountainous and hilly portion of the Rawal Pindi district, all trees and shrubs of spontaneous growth are hereby declared to be the property of Government. They are available as far as they are really required by the villagers for domestic or agricultural purposes, but with this exception may not be cut or appropriated by any person without the permission of the civil authorities. This rule, however, is to be liberally construed as regards the comfort and convenience of the villagers.

(2) Upon receipt of an application for timber trees the district authorities are entitled to determine the quarter in which they may be cut, and are to demand a tax. On payment of the tax they are to depute an official to mark, in concert with the applicant, the very trees he is allowed to fell. But no trees are to be selected for this purpose within 300 yards of the main site of a village, or which have been evidently appropriated for shade, or ornament to religious buildings, or for the comfort of the villagers.

(3) The tax on fir trees of every description is fixed at one rupee per tree.

(4) On trees of greater value, such as Kangur and Toon, a higher tax may be laid, provided that it does not in any case exceed Rs.5 for one tree.

(5) Where permission is given to cut brushwood, either as fire-wood or for lime burning, the tax in the former case will be Rs.2 per 100 maunds of fuel, and in the latter R.1 per 100 maunds of lime. The civil officer is to select the spot at which the cutting may take place, and the cutting is to be effected in such a manner as to leave a length of stump sufficient to ensure a reproduction of the supply.

(6) The setting fire to forest grass, or other combustible substances in a manner calculated to destroy or injure trees, or shrubs,

or felled timber, is prohibited ; and the owners and occupants of the land will be rendered responsible for such conflagrations occurring within their bounds.

(7) This prohibition is not, however, to extend to the burning of grass in open spots with a view to improve pasturage, provided care is taken that the conflagration shall not extend so as to commit the injury described in the foregoing paragraph.

(8) The heads of villages, village accountants and watchmen, and the police and revenue establishments, are all bound to aid in carrying out these rules.

(9) Of the fund obtained by means of the taxes, the proprietors of the villages in whose area the trees or brushwood are situated will receive one-eighth or 2 annas in each rupee, on the condition of their co-operating with the officers of Government in enforcing the rules. The remainder of the fund is intended to pay for the cost of surveillance, and to provide means for reproduction of trees.

(10) Any person who shall infringe any of these rules may be fined at the discretion of the civil authorities to any amount not exceeding Rs.100 for each offence. Such fine may be realised by sale of personal property, and in the event of its non-realisation the offender may be imprisoned for a period not exceeding three months, with or without labour.

(11) The above rules do not concern the forests on the hilly range from Shaldeetta to the Jelam River alone, but all tracts of considerable extent in other parts of the district also, such as the Khairi Moorith mountain, with its surrounding jungle and offshoots, the range commencing on the Indus and coming down beyond Futtah Jang, etc.

This was an excellent commencement of a much-needed forest conservancy in this district, and marked an adequate recognition of the existing state of affairs and the requirements of the future.

There remains to be described for the period under review the progress of forest management in Hazara which, with the exception of Kangra and Hoshiarpur, was considered at this period to be the only well-wooded district of the Punjab proper. We find that forest conservancy had, for that day, made some progress in this area.

In the year 1855 draft Rules for the conservancy of forests in the hill districts were forwarded by Mr. Temple, Secretary to the Chief Commissioner, and an Annual Report was called for. In 1856 Captain Becher, Deputy Commissioner, reported the position and extent of the principal forests in the district, and remarked : "These forests occur at intervals on the

higher ranges, extending over a great space, and are often situated where the want of roads and water-carriage renders them almost useless." The chiefs and headmen were directed to observe that no wanton destruction took place, the Deputy Commissioner ordering that young trees should be spared and intimating that any infringement of the Rules, which were to be introduced, would be met by a fine not only on the offender but on his village. One rupee was charged for each tree of deodar, blue pine and *Pinus longifolia* felled, the trees being selected and marked by an official previously. At this stage Becher did not consider a special establishment necessary as the demand was chiefly on the part of Government, and the forests were widely scattered and often on the frontier. He recommended conservancy through the chiefs and people themselves, controlled by the *thannadars* (police inspectors) and their establishments, who were to make occasional visits to the forests and report cases of destruction. This was not a very efficient manner in which to commence forest conservancy, as the danger of bribery and collusion was too great. But it was a beginning.

In the same year (1856) Sir H. Edwardes, the Commissioner, forwarded a set of Rules, which he and Becher considered well adapted to the conditions of the district. This code received the sanction of the Chief Commissioner in January, 1857. Two rangers were then attached to each of the ten police stations.

The receipts for the year 1856-7 were : Seignorage, for two years (minus the share paid to Zamindars as per Rules below), Rs.992, and expenditure, Rs.867, showing a balance of Rs.125.

The Rules, entitled "Forest Conservancy Rules," be it noted, which thus received sanction and came into force before the close of this period, were as follows :

RULES FOR FOREST CONSERVANCY IN HAZARA, 1857

(1) The forests now existing in Hazara are under the exclusive charge of Government to preserve them from destruction and waste.

(2) Within the hills and forests the land-owners and their cultivators may fell such trees as are actually required for the building of their own houses, cattle-sheds, etc., or for the manufacture and repair of their own agricultural implements, but intimation must be sent to the nearest thanna. The *thannadars* send weekly reports to the sudder station, whence they are made over to the Jemadar of rangers, and he sends his subordinates to inspect the localities.

(3) When villages, with no forests of their own, have hitherto enjoyed the prescriptive right of cutting timber from the hills, or land of other villages, for *their own* use, they will have the same privileges as land-owners and others mentioned in Rule 2.

(4) No one is permitted to fell trees for the purpose of clearing ground for cultivation without the special permission of the Deputy Commissioner in writing.

(5) Zemindars, etc., are forbidden to fell young forest trees or saplings of any tree for fuel or *for sale*, or for other purpose than that given in Rule 2, and under any circumstances saplings of deodar, biar (blue pine), ash and toon are forbidden.

(6) Zemindars are forbidden to give or to sell any trees of those kinds which pay seignorage to other people than those included in Rules 2 and 3, or to allow trees to be removed without the order of the Deputy Commissioner.

(7) Zemindars are permitted to graze cattle and sheep in the forests in question, but are strictly forbidden to set fire or to allow others to set fire to old grass in the *vicinity of forests* in order to get a new crop of grass, as this injures and destroys the trees. No excuse of accident or ignorance will be listened to.

(8) Zemindars, travellers, and others are forbidden to set fire to trees (growing or dead) for the sake of frightening wild beasts or warming themselves in cold weather, or cutting torches out of the trunks of growing trees, by which practice many fine trees have been annually destroyed in these hills.

(9) All persons, not land-owners, or cultivators of land, or those specified in Para. 3, as having prescriptive right (not excepting Government agents or officers of any Department), who require either saplings or trees for any purpose, must apply to the Deputy Commissioner, who will give them a written order, on prepayment of a fee for each tree, according to the printed scale ; half of which will be given to the land-owners, and half will be kept by Government on account of the forest establishment.

(10) Brushwood being abundant on all the hills in Hazara, and the demand being small, there is no present necessity for imposing any restriction on its use.

(11) No person is allowed to fell or injure, or let his cattle injure trees or groves planted by Government on the sides of roads, in cantonments, civil stations, or elsewhere.

(12) No person is allowed to cut or injure the trees in Ziarats or groves held sacred by the people.

(13) Any person or persons, land-owners or others, who shall break any of these rules, or commit any act of injury to the forests or trees thus taken under Government protection, will be fined at the discretion of the civil authorities, to an amount not exceeding one hundred rupees for each offence realisable, if necessary, by sale

of personal property, or in default of payment, commutable to imprisonment for not more than three months.

(14) It shall be the duty of the several thannadars within whose circles the forests lie to carry out these rules, for which purpose forest rangers are allowed to them.

In 1851 the question of steam fuel on the Upper Indus first began to receive consideration. Mr. Edgeworth, C.S., who was an accomplished botanist and had previously travelled and botanised in parts of the Western Himalaya, which had been rarely visited by Europeans, was then Commissioner of Multan. He recorded his views on the fuel question in a letter to the Board of Administration, of which the following is a summary :

"On the banks of the Gugaira, Captain Marsden reports a sufficiency of fuel to last 20 years at the rate of 22,000 maunds a year. In the Multan district fuel is abundant, and a large proportion of it tamarisk. I should say there is an inexhaustible supply, as the production would equal the consumption. The native agent at Bhawalpore reports that the territories of the Nawab cannot supply any continued demand."

Edgeworth suggested that "it would be worth while to form plantations of Babul (*Acacia arabica*) and tamarisk in some of the abundant waste lands along the rivers at suitable places for steamers. The tamarisk grows readily either from seeds or cuttings, the babul very readily from seed, and scarcely any expense would be incurred after the original planting. A single watchman at each plantation or reserve would be sufficient. These reserves should be so arranged as to present a succession for copping through a course of eight years, which would allow a sufficient time for the wood to attain a size suitable for fuel."

These suggestions showed that Edgeworth had studied this subject from a practical point of view, and had concrete ideas on the necessity of having a series of age gradations, in order to maintain a continuity in supplies. His views were submitted to Dr. Stocks, Forest Ranger in Sind (see below), who entirely concurred as to early planting of babul and tamarisk on the waste lands along the rivers. During the next period of this history it will be shown that this fuel question had reached a very acute stage owing to the advent of the railway, the demand for the locomotives creating an entirely new position.

THE SIND FORESTS IN 1851-7

Sind was conquered by Sir Charles Napier in 1843, the Amirs of Sind being deposed and the country annexed after the battles of Miani (17 February, 1843) and Dabba. Lord Ellenborough was Governor-General at the time, and the conquest of the country subsequently gave rise to considerable controversy, the home Cabinet under Sir Robert Peel (which Gladstone had just joined for the first time) having disapproved of the step taken. The interest of the Miani battle lies in the fact that Outram was deputed by Napier to burn the Miani and neighbouring forests in which it was believed the left wing of the enemy would be posted.

Sind was not incorporated with the Bombay Presidency till after the Mutiny. Since allusion has been made to the forests in a foregoing paragraph in this chapter, and they have somewhat similar characteristics to parts of the plains area of the Punjab, a consideration of the progress in Forest Conservancy made in them at this period is given here.

The forests of the province had been under management for some time. The babul forests had been long worked, and had yielded considerable amounts of timber for ordnance purposes and for the Karachi harbour works.

The Sind Forests were originally made by the Sind Amirs for hunting purposes, and the methods they employed to obtain a forest growth were well adapted to the ends in view. They enclosed large tracts of ground by stakes, or with a wall, and then left the area inside to become covered with a natural jungle unchecked and untended in any way. Care was taken to see that neither goats nor camels, both extremely destructive to young trees, got into the enclosures. In fact, strict prohibition was enforced against the entry of either man or animals. Dr. Stock, the Forest Ranger in charge of the Sind Forests in 1851, describes the enclosure method, in reply to an enquiry from the Punjab, with other interesting details regarding the forests, as follows :

"The annual inundations of the river, and the babul seeds contained in the soil from the dung of domestic animals, and the perfect and unrepressed growth of whatever should come up, produced in the course of a very few years a thick and impenetrable jungle, which by degrees rose into the name and dignity of a forest. Not that the Sind Forests

resemble forests in the rest of India, they are but skeletons lining the river bank, and presenting only clumps of trees in the interior, the whole connected by low jungle or bare wastes. Should it be wished to begin the formation of new forests in Sind, there are excellent localities, and the same facilities as in the Ameer's times ; as perhaps similar circumstances and localities exist on the Punjab rivers, I may describe them.

"Capricious though the Indus is, deserting one year a channel which it had formed the last, and washing away a bank only just made, still there are certain localities presenting features of greater stability, and which can be pretty well depended upon as likely to continue along low level spots, common on both banks, these have at first nourished only tamarisk, but in which afterwards sprung up trees of the babul and poplar. High freshes of the river, or a high inundation, cover partially spots of the land. Nothing is required to form a forest here but to protect the jungle from the grazing of camels and goats, and the inroads of the charcoal burner. This requires co-operation of the neighbouring village authorities, combined with the presence of a Government keeper, or a fence and keeper. A great deal will depend upon local circumstances, upon the distance or nearness of villages, and upon the help obtained from the subordinate Civil authorities. But probably, as suggested by Mr. Edgeworth, a single person would be sufficient at each preserve ; one person, however, should never have a beat of more than a mile in all directions, or he will not attend to the outlying parts of his duty. Babul seeds might be saved in favourable localities, to scatter over places where they would not spring up naturally. The chief points to be insisted on are to choose a place where a jungle already springing up shows the capabilities of the soil and its natural aptitude for the development of wood, and then carefully to protect the young trees from grazing of all descriptions.

"In Sind, where, as a general rule, there is absolutely no rain, this is the only way of encouraging the growth of trees. In some parts of the Punjab, however, the presence of regular rain would modify the above remarks ; in such parts forest may be made from seedlings or cuttings in places removed from immediate inundation, and yet in spots whence wood could be collected for steamer fuel. In Sind, all growth of wood and of natural jungle, as well as all the operations of

agriculture, are dependent on the river, and must be limited to its banks or to the banks of its branches. And hence it is that advantage must rather be taken of the state of the river banks as they at present exist than by forming any large reserves of picked or chosen woods on more elevated and stable ground above the river bank. So that the cutting of wood for steamers is more a thinning of jungle which has come up in free and unrepresented growth, than a regular and systematic cutting down of portions of a planted reserve, regulated by calculations of growth and expenditure."

Captain Hamilton was in charge of the Sind Forests during 1855-6, and submitted a Report on the working of the forests, which was the last Report, it is believed, to be reviewed by the Court of Directors (in 1856) before their disappearance as the result of the Mutiny, which was to burst upon the country the following year. At this time, owing to the neglect of these forests, there was great apprehension of the supply of fuel for the Indus Flotilla failing in a very short time.

In the following year, Mr. W. A. Dalzell was acting as Forest Ranger in charge of the Sind Forests. In reply to an enquiry from Mr. Thomas, the Collector of Coimbatore, he forwarded the following interesting Memorandum on the subject of the Forest Rules and establishment in force in Sind in 1857, the total area of forest under supervision at the time being 700 square miles.

The Memorandum is of such interest when the period at which it was written is taken into consideration that it is quoted below :

"None of the Sind forests are rented out on contract. Timber is felled under the immediate supervision of the forest karkun. The parties requiring timber make a written application to the forest ranger, stating the name of the forest, and the sizes and kind of timber required ; an order to the forest karkun to cut the timber is endorsed on the application. The receipt, along with actual measurements, is forwarded to the forest ranger's office, where the bill is made out and forwarded to the forest tappedar for the recovery of the sum due. No timber is allowed to be cut without a written order from the forest ranger ; and at the time of its being cut, either the karkun or a jamadar is present. As one or two peons are attached to the forest, valuable timber cannot easily be carried off clandestinely ; at least such cases are extremely rare.

" Fuel and timber are sold in the same manner as any other commodity. Fuel is sold by retail only at one place, leading from the forest to the town of Sukkur ; it is there weighed, and the money paid to the karkun stationed there ; this karkun is under the supervision of the forest karkun. Fuel sold to public departments, the railway, the Indus Flotilla, etc., is paid for to the forest ranger direct, the bills being made out according to the receipts forwarded by the forest karkun to the ranger's office. Weekly statements of the balance of fuel are made to the forest ranger.

" The establishment of the forest department consists of 1 forest ranger, 2 deputies, 1 inspector, 1 accountant, 1 head munshi, 1 second munshi, 2 writers, 12 forest karkuns, 2 daroghas, 13 jamadars, 98 peons. The Forest Ranger has the general management and control over the whole department ; he personally inspects the forests during six months of the year. The deputies are stationed at distant points, and assist in the inspection of the forests, sending in weekly reports of their doings. The inspector also aids in the same duties, and examines carefully the account-books of the forest karkuns.

" Each forest karkun or tuppedar has charge of four or eight forests situated within a distance, from one end of his charge to the other, of from 15 to 50 miles. He travels almost constantly from one end of his charge to the other, transacting business, such as issuing pass-notes for grazing, looking to the preparation of fuel, paying labourers, superintending the cutting of timber, measuring the same, writing his accounts, making advances of money to wood-cutters, watching the river banks, and many more things of this kind. Under each forest karkun there is one jamadar, who also travels about through the forests, seeing that the peons do their duty, and making reports to his immediate superior. One or two peons are attached to each forest ; there they remain constantly ; they seize any cattle grazing without a pass ; they look after the preservation of the forest, and are in general held answerable for any damage which may be done. The total cost of the establishment is Rs.2199 per month."

It will be observed from the Memorandum that the chief preoccupation of the Sind Forest staff of the period appears to have been directed to seeing that their Rules were enforced and to revenue making. For there is no word on the subject

of any attempt to ameliorate the conditions of the woods, which were rapidly approaching the nature of scrub forest, or of their extenson. If the report, however, presents the situation existing in Sind at the time it affords evidence that the commencement of a forest conservancy considerably in advance of any other part of India, had already been instituted within the Province.

CHAPTER XVI

FOREST OPERATIONS IN THE PUNJAB AND WESTERN HIMALAYA *(continued), 1850-1857*

SIMLA IN 1853 AND ITS FUEL SUPPLY

EVEN in these early days Simla, where a Hill Station or Sanitarium had come into being under this name by 1826, was already beginning to feel the pinch brought about by the growing decrease in fuel supplies. Neither the Punjab Government nor the Government of India had yet moved up to what subsequently became the Summer Capital.

The beginnings of Simla were as follows : A tract of land including part of Simla Hill was retained at the close of the Gurkha War of 1815-16. Upon this the first British residence, a mere cottage of wood and thatch, was erected in 1819 by Lieutenant Ross, Assistant Political Agent in the Hill States. Three years later, in 1822, the first permanent house was erected. This was the work of Lieutenant Kennedy, successor in office to Lieutenant Ross. His example was quickly followed by officers from Umbala and neighbouring stations, and by 1826 the new settlement had acquired a name.

Dr. Falconer, Superintendent of the Calcutta Botanical Gardens, who, as has been already described, visited and reported on the Tenasserim Forests, studied the question of the Simla fuel supplies during a visit to the Station in 1853. As a result of his investigations he wrote an able Memorandum on this matter, dated 16th November, 1853. This Memorandum furnishes an interesting pen picture of the position as it existed at the time, and present-day Simla residents may read with something more than curiosity of the troubles of their predecessors in the fair hill capital some seventy years ago.

"The Hill Stations," wrote Falconer, "have long been suffering from a yearly decrease in the supply of firewood. The

nearest patches of woodland have been gradually denuded of trees, so that the supplies have now to be drawn from a distance, with increase of labour and an enhancement of price. The station of Simla was fixed on a spot originally surrounded with trees ; immediately below the ridge there were wooded crags and slopes covered with *Rhododendron*, *Andromeda* and oak, with many other species, while the ridge and slopes upon which the station stands, abounded in deodar and other *Coniferae*, and beyond it the lofty ridge of Mahasu was clothed with magnificent forest, descending on either side a long way down the slope. The trees adapted for most economical wants were in such abundance in the neighbourhood, that had the natural wealth been husbanded with prudence, it would have yielded a continuous and ample supply ; but except within the mere boundaries of the station itself, the trees were cut down for firewood with the most wasteful improvidence, and no adequate attempt was made to replace the felled trees by the growth of young plants."

Falconer's plan for providing in future for the essential fuel supplies of Simla and the neighbouring hill stations was, in the main, by forming plantations even to the extent of reacquiring land which had been put under agriculture for this purpose, a proposal which was unlikely to be viewed with approval by the Civil officers. Forest Conservancy, in its scientific aspects, he did not appear to consider a possibility ; nor did he think it would be possible to stop the annual conflagrations caused wilfully by graziers. But this was the opinion commonly held at the time ; and later by many Forest Officers when Forest Conservancy began to be introduced into the country. But some of the opinions expressed in the Memorandum were those of a far-seeing man, and much ahead of those held by the majority of officials of his day, and therefore he may be left to develop his exposition of the case and his suggested remedial proposals as expressed in the Memorandum. He continues :

" The attention of the authorities at Simla was long ago awakened to the impending evil, but the circumstance that the forest tracts surrounding the station belonged to protected hill chieftains, who had the uncontrolled management of their own possessions, deprived them of the power of providing a timeous and suitable remedy.

" The same want, arising from like causes, has successively affected the stations of Sabathu, Kussowlee and Dugshai,

and to such an extent either now felt or in prospect, as to have called for the interference of Government.

" It would appear that in 1845, 20,000 young trees were planted in the Government district of Kotgurh, but with so little success that after eighteen months only 800 survived. I am unacquainted with the particulars of that experiment, the kinds which were tried, the exact nature of the ground, or the circumstances under which they were attempted to be grown, being points of great importance in the case, for species which would grow well among the wooded heights of Hattu above would fail on bare ground at Kotgurh below, but I entirely concur in the opinion expressed by Mr. Edwards, that no good will ever arise from forming plantations on ridges, or hills, or slopes, that are now bare and covered with grass, and with him I believe that such tracts have not probably at any time been clothed with trees, that they have always borne grass or herbaceous vegetation.

" But the same objection will not apply to ridges or slopes that have been bared by indiscriminate felling. However denuded they may be now, suitable measures will restore them to their former wooded condition ; for where a tree has once grown, trees may be grown again.

" The remedial measures proposed are : 1st, to rear young plantations throughout the hills on new sites ; 2nd, to preserve and renew the forests already existing.

" The Superintendent of the Hill States, Mr. Edwards, thinks, that instead of forming new plantations on waste lands or where they have not been before, attention should be restricted to the preservation and renewal of the forests and copses now existing. He argues that it would be impolitic to restrain the zamindars in their efforts at extending their cultivation, on waste land and forest clearances, more especially as plantations formed on such lands would not be available for use under 40 to 100 years.

" Mr. Edmondstone, the Commissioner of the Cis-Sutlej States, on the other hand considers with good reason that the remoteness of the prospect of return, even if above 40 years, is no sufficient argument against new plantations, and that it is the duty of Government to provide for the future as well as for present wants ; he thinks that the best land, when required should be appropriated for plantations, although at the expense of extended cultivation, and recommends that plantations should be formed everywhere within the

bounds of the Simla jurisdiction. The number to be limited only by the means available for adequate supervision.

" Many years ago I passed through the hill country in question, and the result of my observation is that in the interior, away from the vicinity of the hill stations, wood is generally so abundant either in belts of forest, copses in the low valleys, or straggling trees, that there is no necessity for forming new plantations except in localities where the returns might *be made available for export on any of the great rivers* to the plains. Supposing that such plantations were formed, of what use would they be? In the majority of cases, the timber would be too remote from any of the hill stations to be available with advantage either for building purposes, or for firewood, and the cost of removal to a navigable channel would be equally against its exportation to the plains. On the slopes of the Chor mountain, between Jubal and Sirmur, within a few days' march of Simla, there are sheets of magnificent forest of primeval and stupendous growth, and equal to the building wants of all the hill stations, but which are at present of no use by reason of their impracticable position, as regards means of removal. It appears to me that the majority of the proposed new plantations would be to some degree in the same predicament. The trees grown upon them would be useful only to the zamindars. But although this in itself would be a very laudable object and deserving of the most favourable consideration by the Government, it has still to be shown, so far as I know, that Government interference is required. In the more elevated situations, the hill people have ample supplies in the pine and oak forests, for all their wants, while in the valleys and on the lower heights where pine logs are not available, it will be found that in suitable localities they plant trees adapted to their wants. In illustration, I may adduce the fact that the tree called *Cedrela serrata* is very commonly grown in ravines near the villages where pines are not to be had. The tree grows with a long, straight, cylindrical unbranched trunk, and it is consequently well suited as a substitute for pine logs in their buildings.

" It would seem to me, therefore, that no general system of planting with an organized establishment is required, for the interior districts, and that besides the protective and penal measures mentioned by Mr. Edwards, nothing more is required of Government than encouragement or reward to the head men of the hill communities, by the remission of revenue or

limited grants of land, where any great zeal has been distinctly shown in the growth of trees, or in the well conserved condition of any patch of Government forest within the village boundaries. With Mr. Edwards, I entertain no fear of a deficiency of timber, either for building purposes or for fuel in the interior of the hill districts, if the natural sources of supply now in existence are conserved with moderate care.

"With regard to the conflagrations which are universally described as being so destructive, according to my observation they are almost in every instance, wilfully caused. The practice is very common in all parts of India, where there are extensive tracts of waste or prairie land used for grazing. At the end of the rains the ripe grass dries up, forming an innutritious fodder upon which the cattle soon fall off, and the most ready remedy is to apply fire, and burn the withered straw in order that the young grass shoots, which spring up immediately after, may be accessible for browsing. Firing the grass jungle is universally practised in the prairie 'khadur' lands along the Terai, where bullocks and buffaloes are grazed and wherever brinjarahs (cattle men) take their cattle in the cold weather. The same object leads to it in the hill districts. The paharees (hillmen) will bide their time patiently for wind and weather suited to a favourable spread of the conflagration. In very many instances, the dry withered grass is an evil, for which burning is the only cure. Under these circumstances, it appears to me questionable whether any amount of injunction, or penal enactment, will be effective against a practice which is so engrained with the wants and the immemorial usages of the people. The best plan would be, to have the plantations in situations not liable to the risk of fire, and the sites best adapted in other respects for planting would be of that character.

"But the case is very different as regards the necessity for plantations in the immediate vicinity of Simla, and the other hill stations. The increasing scarcity of timber and fuel has been long felt, and a remedy for the want is urgently required, the planting measures suggested by Mr. Edmondstone might be applied here with great advantage and effect : as regards Simla it would seem advisable, that all the lands around the station that formerly bore wood and are now bared, should be carefully planted. The object is of such importance that for a local and partial case, like this, I would be inclined to agree with the Cis-Sutlej Commissioner in the opinion that

although it might interfere with the efforts made by the zamindars to reclaim waste land, in some localities this ought not to be regarded as a serious obstacle. The ridge and slopes of Mahasu, which were formerly covered with the finest timber, present localities for planting that are hardly surpassed anywhere on the hills, all the finest pines and oaks of the Himalaya would grow well there, and if the zamindars have extended their cultivation upon the bared portions, high up towards the ridge, it would seem in every way desirable and expedient to restore the whole of such land to its original wooded condition, giving compensation to the interested parties for the appropriation ; a partial application of the ground for this purpose would not be sufficient. In Mr. Secretary Melvill's letter it is stated, that for nurseries a very little land goes a great way, and that many thousand trees can be raised on a single acre. That is true as regards seedlings and young plants only ; as trees grow up they require room, good oak timber cannot be grown with a less interval apart than 40 feet, being equal to $27\frac{1}{2}$ trees per acre ; and for the largest pine trees, 30 feet interval or $48\frac{1}{2}$ to the acre. For this reason, therefore, a large area would be required for the timber forests reserved for Simla.

"The chief difficulty in the way of establishing suitable plantations near that station would appear to be the circumstance, that the adjoining forest lands belong to the hill chiefs (of Keunthal and Koti) while those in the Government districts are for the most part remote or unimportant. Mr. Edwards is of opinion, that it would be highly objectionable and improper to exercise a direct interference with these chiefs, in the management and conservation of their forests, which he considers they have a right to dispose of as they think fit. This is a question of general administration which is wholly beside my province in these observations, but I would remark that little faith could be placed in the efficiency or eventual success of any remedial measures, which depended merely on the good-will and arrangements of the chiefs. They will, no doubt, gladly avail themselves of any enhancement in the rates imposed for felling trees, that will increase their own revenue, but I doubt if any amount of persuasion, suggestion, or advice on the part of the Simla Superintendent, would induce them to undertake sustained measures for the renewal and protection of their forests, involving expense, which could be relied on. The course resorted to by Mr. Edwards, will

doubtless lead to some palliation of the evil ; but the results will probably be variable and uncertain.

" In order that any planting operations in the immediate vicinity of Simla or the other hill stations, should prove successful, it would appear to me essential that the Government should acquire, whether by purchase, exchange, or other form of compensation, a proprietary right in, or lease in perpetuity of the lands to be so appropriated, and of the villages adjoining them ; without some arrangement of this kind it is not readily obvious how the plantations could be properly managed.

" I am not sufficiently acquainted with the localities of Kussowlee and Dugshai to give my opinion as to the special sites upon which planting ought to be conducted near them. They are at a considerably lower elevation, and the kinds of trees both of the pine and other tribes, would require to be different from those grown near Simla. The acquisition of the ground for the plantations by the Government would be as necessary in these cases as at Simla.

" Mr. Edmondstone suggests that much aid might be derived in supplying Kussowlee and Dugshai with fuel from the forest slopes on either side of the lower or Siwalik Hills, all along the Pinjore Valley, which are covered with low jungle. There is no doubt that any quantity of fuel might be drawn from that quarter and transported from Kalka to Kussowlee, Dugshai and Subathu, the question is one merely of expense ; the cost of carriage of Siwalik firewood would fall heavy, and it would be much more advantageous in every respect, that the hill stations had sources of supply nearer their own doors ; but Mr. Edmondstone's suggestion relieves any cause of anxiety about fuel for military hill stations, when the resources in their vicinity have been exhausted. For many years past the beams and heavy timber used in the construction of houses at Mussoorie and Landour have in most cases been carried up the hill from the valley of Dehra below.

" With regard to the penal measures proposed by the Cis-Sutlej Commissioner for the protection of young and undersized trees, if their operation is to be restricted to the forests close to Simla, and the other hill stations, the urgency of the evil might excuse such heavy penalties, but I do not see how they could be enforced in the interior districts, without a large and expensive establishment, nor having regard to

what is stated above, that they are there wanted. The people require timber of all sizes for various economic uses and they have been for ages in the habit of using bark and shingle for roofing. A large cedar (deodar) tree is often cut down merely to furnish a few wide planks for doors, the great mass of the trunk being left to rot; and where the timber cannot, by export, be turned to a more profitable account, it is not very obvious why restrictions should be imposed on the free use of it. It would appear to me, that any penal enactments of the kind, applied to the interior, would necessarily be inoperative, and the graduated scale suggested by Mr. Edmondstone would probably prove very difficult of practical application to the forests near the hill stations; as it would not be easy in every case to determine the age of the trees. The highest fines (20Rs. for destroying trees of less than five years' growth) seem to be unnecessarily severe, and on this account calculated to defeat their object. The general protective measures, mentioned by Mr. Edwards as being now in operation, under the new settlement are apparently sufficient for the districts in the interior."



PART IV

THE INITIATION OF FOREST CONSERVANCY
IN INDIA, 1858-1864



CHAPTER XVII

THE HISTORICAL POSITION OF THE FORESTS DURING THE PERIOD 1858-1864

THE INDIAN MUTINY AND ITS RESULTS

AFURTHER and unforeseen devastation of a part of the forests of India took place during the period now dealt with, the forests of Central and Upper India bearing the chief brunt of the unorganised and destructive fellings which were made in them—a destruction which has caused the Forest Department much bitter uphill work to remedy; for the rehabilitation of these forests will be the work of another half century and more; whilst some forests suffered so severely as to practically disappear.

To enable the cause of this devastation to be understood, occurring at a time when the first fair beginnings of Forest Conservancy were appearing in some parts of the country, and after the pronouncement of the Forest Charter by Lord Dalhousie, allusion must be made to the historical and political condition of India at this period.

The Indian Mutiny burst like a bombshell over the country in May, 1857. The end of this struggle saw the disappearance of the old East India Company and the Court of Directors, and Queen Victoria was proclaimed Empress of India.

The Mutiny taught the British the danger of isolation due to the want of facilities for rapid communication, which were practically non-existent throughout the country. A tremendous impetus was given to railway construction, and this impetus was severely felt by the forests.

When Lord Canning succeeded Lord Dalhousie as Governor-General in 1856, the condition of British India had never been deemed more fair and promising. The farewell address of the latter had declared that India was "in peace without and within," and that there appeared to be "no quarter from which a formidable war could reasonably be expected at

present." This conviction seems to have been general amongst the whole of the Anglo-British community, and was voiced by the British and Anglo-Indian Press. The native army was considered to be absolutely loyal, and there appears to be little reason to doubt that, at the time of Lord Dalhousie's departure, in spite of Russian and Persian intrigues, in the main there was little disaffection. That the Company's rule was vitiated by glaring abuses and acts due to a short-sighted policy is now a matter of history ; but the caste system of the people and their religious susceptibilities had been treated with a wise discretion. The *Pax Britannica* ran throughout the country, as was evidenced by the security afforded to private property, the great increase in the agricultural prosperity of the country, and the enormous increase in the flocks possessed by the community, an unfailing sign of orderly rule ; for herds of cattle are a class of property particularly subject to theft in unsettled communities. Compared to the condition of things half a century earlier India was peaceful, orderly and achieving prosperity. The statements contained in Lord Dalhousie's address may be considered to faithfully represent the position of the country at the time.

It is true that there was a section of opinion at home which considered that the Indians should be given a larger share in the government of the country. But this opinion was practically confined to those who had never been in the East, nor come into close touch with the great variety of different races of India, and the methods of the existing administration. India was far from ready for such experiments. India was still uneducated. It was only in 1854 that measures for extending education by Government grants were adopted, and these measures were at first viewed with strong distrust by the people, a distrust which was fanned by an active propaganda, which attributed the new departure to a wish to proselytise the people.

Perhaps one of the chief causes of general discontent in India, apart from the special cause of the Mutiny, was to be found in the policy of the Company to spend as little on improvements in the country as possible. In the case of the forests the history of the first half-century brings this attitude into strong relief, when the trumpery expenditure on such small staffs as were sanctioned for forest work is taken into account. The expenditure of the Company on public works in India was but little greater. Large sums were expended on the salaries

of the large staff of high officials, and the great number of Collectors throughout the country, and on the revenue establishment generally ; but the amounts allotted for the engineers' staff and public works were kept as low as possible. That this was a short-sighted policy in a country such as India, a mistake which the common mass of the people themselves would readily realise as a hardship, is beyond dispute. For the Government's predecessors had from time immemorial acted very differently. Under Mahomedan and Hindu government, the princes and nobles had ever delighted in associating their names with some stately edifice, some great road or canal, some public work of more or less utility. It was a fashion which those who made fortunes and a name delighted to follow. The Company had made no effort to follow an example so generally understood and expected by the people. On the contrary, in this matter they had pursued a policy of narrow-minded short-sightedness, which it is difficult to credit, when it is remembered that though they were traders they had evinced a wonderful shrewdness in bringing peace to the country as a whole. Nor did any of the British who made great fortunes in the country, with the exception of such notable examples as Sir Henry Lawrence and a few others, ever think of devoting a portion of their wealth to India, where they had accumulated it.

The absence of good roads in the country at this period was notorious. They were confined to a few Grand Trunk roads and others required for purely military or governmental purposes ; and those made by the British Planting community in the districts where they carried on their operations. Railways were practically non-existent. The consequence of this parsimonious and short-sighted policy was severely felt in the periods of recurring famine, due to the failure, or partial failure of the monsoons, to which India is always liable. In the almost total absence of transport facilities these famines resulted in a terrible mortality amongst the people of the afflicted districts. That no strong effort had been made to minimise these difficulties and reduce the danger is a grave indictment of the Company's administration.

The same apathy displayed in the construction of communications was apparent in the absence of any systematic efforts to dig canals and tanks (pond or lake) for the agricultural community. And the lack of communications also had a serious effect on the accessible forest lands in the neighbour-

hood of the large cities and towns. The repeated demands made upon these areas to provide for the requirements of the communities led through constant and ruthless exploitation to the entire disappearance of considerable forest tracts.

This was the position when, in 1856, the Authorities decided upon replacing the old "Brown Bess" musket by the "Minie" rifle. The cartridges of these rifles were greased, and the soldiers, in the words of the drill book, had "to bring the cartridge to the mouth, holding it between the forefinger and thumb with the ball in their hand, and bite off the top elbow close to the body." This was tantamount to asking the high-caste native to defile himself and lose his caste by touching the fat of animals, and probably of cows. For the fat used for the cartridges made at home was from animals, and the paper so treated had to be torn with the teeth before the cartridge could be used. The representations of the Sepoys were treated with contempt by the Commander-in-Chief, in spite of warnings from British officers who understood the true position; and a belated attempt to revoke the order came too late. There were other grievances connected with the decision that all regiments, including the Bengal ones, must undertake over-sea service, the order entailing a loss of caste to the latter which might take years to get back.

The peace and prosperity of the spring of 1856 had disappeared in the opening months of 1857, and on Sunday, May 10th, the Indian Mutiny broke out at Meerut. Nearly a year elapsed before the insurrection was quelled. During that period the extraordinary want of statesmanship and vacillation which heralded and attended its opening phases had given place to numberless examples of unexampled heroism; many fine and brave men, British and Indian, had gone to their long account; whilst British women had shown once again the magnificent courage with which they are capable of facing adversity and even death.

The incidence of the Mutiny at once threw into glaring relief the paucity of the communications in the country. The necessity for railway construction, if only to facilitate the movement of troops and their equipment, had become evident. The Government set themselves feverishly to work to repair the want of foresight of their predecessors. The urgent demands for timber to provide the sleepers for the new railway lines were met in the time-honoured fashion, and great forest areas in the central and northern parts of India which, owing

to the scanty population and their inaccessibility, had hitherto remained untouched by man, were ruined in order to supply the demands. No supervision was exercised over the work. Large numbers of trees were felled in the forests without reference to the possibility of extracting the logs, numbers of which remained *in situ* unutilised, to be subsequently burnt in the jungle fires. It was the aftermath of the Mutiny, and unfortunately within a few years damage was done to these fine forests which has exercised all the skill and knowledge of the Forest Department to repair, and will take many more years to complete. This exploitation on the old lines occurred in the first years of the newly reconstituted Government in India. In Bombay, Madras and Burma, especially in the latter Province under Mr. Brandis, as will be shown, some progress in true forest administration was attempted, as a result of the enunciation by Lord Dalhousie of a definite Forest Policy. And notable beginnings were made in the Central Provinces and the Punjab, as will be detailed. In the N.W. Provinces, Oudh, Bengal and Assam, conservancy was only in the initial stages at the close of the period here dealt with.

The old East India Company did not long survive the Mutiny. The same storm which drove the last of the Moguls from Delhi to exile and death in Burma destroyed the great Company whose sovereignty had been founded on the crumbling ruins of the Mogul Empire. The East India Company had failed to advance with the times. They had continued to govern India as they had commenced sixty years and more before. The Mutiny had increased the debt ; repeated financial crises had been the outcome of their rule in the latter years ; private enterprise and trading were discouraged, the great resources of the country remained undeveloped, and the commerce of the country was negligible.

The British people recognised that the form of government, which led to the Mutiny, had failed ; and the subsequent publicity given to the maladministration of the country justified this view. The "double Government" of the Crown and the Company was no longer possible, and the entire administration was therefore assumed by the nation.

On the 1st November, 1858, a royal proclamation, issued throughout British India, declared the sovereignty of Queen Victoria as Empress of India.

The assumption of the duty of governing India by the

hood of the large cities and towns. The repeated demands made upon these areas to provide for the requirements of the communities led through constant and ruthless exploitation to the entire disappearance of considerable forest tracts.

This was the position when, in 1856, the Authorities decided upon replacing the old "Brown Bess" musket by the "Minie" rifle. The cartridges of these rifles were greased, and the soldiers, in the words of the drill book, had "to bring the cartridge to the mouth, holding it between the forefinger and thumb with the ball in their hand, and bite off the top elbow close to the body." This was tantamount to asking the high-caste native to defile himself and lose his caste by touching the fat of animals, and probably of cows. For the fat used for the cartridges made at home was from animals, and the paper so treated had to be torn with the teeth before the cartridge could be used. The representations of the Sepoys were treated with contempt by the Commander-in-Chief, in spite of warnings from British officers who understood the true position; and a belated attempt to revoke the order came too late. There were other grievances connected with the decision that all regiments, including the Bengal ones, must undertake over-sea service, the order entailing a loss of caste to the latter which might take years to get back.

The peace and prosperity of the spring of 1856 had disappeared in the opening months of 1857, and on Sunday, May 10th, the Indian Mutiny broke out at Meerut. Nearly a year elapsed before the insurrection was quelled. During that period the extraordinary want of statesmanship and vacillation which heralded and attended its opening phases had given place to numberless examples of unexampled heroism; many fine and brave men, British and Indian, had gone to their long account; whilst British women had shown once again the magnificent courage with which they are capable of facing adversity and even death.

The incidence of the Mutiny at once threw into glaring relief the paucity of the communications in the country. The necessity for railway construction, if only to facilitate the movement of troops and their equipment, had become evident. The Government set themselves feverishly to work to repair the want of foresight of their predecessors. The urgent demands for timber to provide the sleepers for the new railway lines were met in the time-honoured fashion, and great forest areas in the central and northern parts of India which, owing

to the scanty population and their inaccessibility, had hitherto remained untouched by man, were ruined in order to supply the demands. No supervision was exercised over the work. Large numbers of trees were felled in the forests without reference to the possibility of extracting the logs, numbers of which remained *in situ* unutilised, to be subsequently burnt in the jungle fires. It was the aftermath of the Mutiny, and unfortunately within a few years damage was done to these fine forests which has exercised all the skill and knowledge of the Forest Department to repair, and will take many more years to complete. This exploitation on the old lines occurred in the first years of the newly reconstituted Government in India. In Bombay, Madras and Burma, especially in the latter Province under Mr. Brandis, as will be shown, some progress in true forest administration was attempted, as a result of the enunciation by Lord Dalhousie of a definite Forest Policy. And notable beginnings were made in the Central Provinces and the Punjab, as will be detailed. In the N.W. Provinces, Oudh, Bengal and Assam, conservancy was only in the initial stages at the close of the period here dealt with.

The old East India Company did not long survive the Mutiny. The same storm which drove the last of the Moguls from Delhi to exile and death in Burma destroyed the great Company whose sovereignty had been founded on the crumbling ruins of the Mogul Empire. The East India Company had failed to advance with the times. They had continued to govern India as they had commenced sixty years and more before. The Mutiny had increased the debt; repeated financial crises had been the outcome of their rule in the latter years; private enterprise and trading were discouraged, the great resources of the country remained undeveloped, and the commerce of the country was negligible.

The British people recognised that the form of government, which led to the Mutiny, had failed; and the subsequent publicity given to the maladministration of the country justified this view. The "double Government" of the Crown and the Company was no longer possible, and the entire administration was therefore assumed by the nation.

On the 1st November, 1858, a royal proclamation, issued throughout British India, declared the sovereignty of Queen Victoria as Empress of India.

The assumption of the duty of governing India by the

British people was to have far-reaching results in a great development in the prosperity of the country. And the forests, amongst other sources of public utility and wealth, were to be gradually brought under an efficient administration. That the importance of placing the forests under a proper system of conservation was fully realised before the close of the period the despatches of the Government of India and the Secretary of State, reproduced in the last chapter of this volume, will sufficiently indicate.

Mr. Brandis could not have taken up his work at a more opportune moment. For if the past is any criterion to the future the great work he was able to accomplish for the conservation of the Indian forests would have proved impossible under the system of administration developed by the East India Company in the plenitude of their power.

CHAPTER XVIII

THE BEGINNINGS OF FOREST CONSERVANCY IN THE MADRAS PRESIDENCY, 1858-1864

DR. CLEGHORN'S WORK IN MADRAS

IT has been already shown that in August, 1856, Dr. Cleghorn submitted a Report to the Government of Madras, containing proposals for establishing Forest Conservancy. These proposals were forwarded to the Government of India for sanction, which was accorded in November. On the 19th December, 1856, Cleghorn was appointed Conservator of Forests in the Presidency of Madras.

During the next five years the Conservator toured through various portions of the Presidency, and submitted three General Reports on the forests and his suggestions for the introduction of an efficient protection and general prescriptions of management. These Reports, with other official documents and some unofficial papers, he subsequently incorporated in his book, *Forests and Gardens of Southern India*, published in 1861, during a period of sick leave at home. This little book, consisting principally of official documents, did not aim at being a treatise on forestry administration in a scientific sense. It was too early for that. But it served its purpose in bringing before the public a totally unknown and, at that time, unattempted branch of Indian administration, and thus, as Brandis subsequently acknowledged, "did much to promote Forest Conservancy in India." It forms an invaluable record of the work accomplished by Cleghorn during this period. He kept his attention focused on the chief points with regard to the protection of the forests, which had for so long been crying aloud for consideration and immediate action, and his recommendations on these heads were a move in the right direction.

Cleghorn sounded the right note, heard almost for the first time in India, on the subject of the necessity of studying the

sylviculture of the forests, laying considerable stress on the necessity of the Forest Officer acquiring a sound knowledge of the principal trees and shrubs, as well as of the climate, soil and forest growth in the different tracts. With reference to that urgent need, the protection of the forests from the improvident acts of the people and the destructive ones of the timber merchant, and even the official, Cleghorn studied the chief sources of injuries to which the forests were subjected—fires, Kumri cultivation, and indiscriminate and uncontrolled cutting, and made strong and wise suggestions to counter and put a stop to these evils. The outcome of his persistent representations was at the time a marked success; in spite of the considerable official, as well as non-official, opposition in several quarters—opposition which a study of the previous history of forest operations will have shown to be inevitable. By an order of May, 1860, the Government of Madras prohibited Kumri cultivation in Government forests without previous permission having been obtained, and directed that this permission should be given sparingly, and never for areas in timber forests. Cleghorn was thus able to secure the application of a measure to the forests of the Madras Presidency, which he had helped to bring into force in the Mysore Forests thirteen years before with, in both cases, most beneficial results for the country and its inhabitants. In securing this great step towards the protection of the forests, he was greatly assisted by the respect and friendship with which he was regarded by the natives. As a medical man his name was widely known amongst them, and this fortunate factor in itself gave him great influence amongst the people. They trusted him and believed in the disinterested nature of his work and proposals, and were aware that he had an intimate knowledge of their mode of life and system of agriculture: both of which, by the way, are indispensable to the good Forest Officer. Cleghorn's popularity with the people and his known keenness for their welfare, so universally acknowledged, was naturally common knowledge amongst the higher officials whose confidence he enjoyed; and to this personal factor, more especially in the light of the subsequent retrograde policy introduced, may be attributed the signal initial success secured by the Conservator in this important matter of protection. It may be mentioned here, in order to maintain the sequence in the narrative, that at a later period Mysore, for a time, again allowed Kumri cultivation within

her forest areas, whilst in Madras the effects of the order of 1860 were subsequently rendered nugatory by the unfortunate tendency of the Madras Government to regard as private property, in default of a proper settlement, a large portion of the forest lands, particularly in South Canara, which had formerly been considered to be the property of Government. This policy caused great injury to the Presidency itself, and to the people generally.

This view of the forestry question, directly traceable to the history of the forests of the previous half-century, was to persist, in fact, for another score of years, and to result in Madras falling from her pride of place as the first Presidency in India to inaugurate the preliminary steps in a true forest conservancy.

For although Bombay appointed the first Conservator, in Dr. Gibson, to Cleghorn, as will be told, the Government of India itself accorded this recognition for the Madras Presidency.

Cleghorn also took up the question of providing from the forests the supplies of timber, charcoal and firewood required without over-cutting and destroying the former. In this connection he commenced the introduction of a suitable arrangement of fellings, in order to secure the maintenance and promote the natural regeneration of the forests. He also devoted attention to plantation work and visited the Nilumbur plantations of which he expressed high approval.

He organised a Forestry Department, establishments for the protection and proper management of the forests being set up in all the districts ; and as a beginning to the comprehensive forest legislation which was to come, local rules for the management of the forests, which were sufficient for the time being, were, on his recommendation, issued by the Madras Government.

Cleghorn's Report on the Nilumbur Teak Plantations, written after a visit paid to them in August, 1857, is of high interest. He prefaced his remarks by saying that the demand for teak timber was then so very great and so steadily on the increase as to indicate that at no distant period a scarcity of large-sized logs would inevitably arise. The scarcity was now being realised, especially as so much was required to meet the purposes of the new Railway Department. He strongly advocated that the plantation work should be increased, as Malabar teak was acknowledged to be the most valuable

timber for shipbuilding purposes then known, and consequently always preferred at the Government dockyards.

Fourteen years had elapsed since the initiation of the planting work when Cleghorn visited Nilumbur, and he bore testimony to the flourishing and satisfactory state of the plantation which, he wrote, " promises apparently certain ultimate success and reflects great credit both upon the judgment of the zealous originator (Mr. Conolly) and upon the perseverance of Chater Menon, the sub-conservator." He had no suggestions to make upon the system of planting. " The seedlings are in a most healthy and thriving condition. The rows grow with singular regularity and mathematical exactness. The later sowings are the finest, partly because the site of Nilumbur is preferable to that of Arriacode, and partly because the distance of six to eight feet between the seedlings has been found to answer better than one yard, which was tried at first. There seems to be only one essential to the entire success of this great experiment, viz. the careful systematic thinning and pruning of the plantation. The good effect of Mr. McIvor's visits to Nilumbur are manifest in the present state of the portions planted in 1843, 1844 and 1845, which had the benefit of his skilled treatment in 1853, 1854 and 1855. It appears to me that a smaller piece of land should be cleared for planting next season, and that the time and labour of the establishment should be chiefly directed to prosecuting the necessary pruning and thinning, which has not been fully carried out for the last two or three years."

This was a salutary hint on the part of the Conservator; for it was obviously useless extending the plantations at a rate beyond the capacity of the staff to undertake work as important as that of attending to those already made, viz. their proper pruning and thinning. For otherwise the object in forming the plantations would be seriously jeopardised and in all probability never attained.

Cleghorn mentions that some wind damage had been experienced in a few of the young woods, a damage predicted by Lord Tweeddale during his visit. He also noted that monkeys broke the leaders and side branches by climbing up into the young fast-growing trees and frolicking about in them.

The Conservator suggested an augmentation of the staff, as with the yearly increase of the plantations the charge was very heavy, and advised the appointment of an Assistant to

Chater Menon, who was at the time already fifty-eight years old; for, in the absence of an Assistant trained by Chater Menon, should the latter find it necessary to retire, his loss would be almost irreparable. Cleghorn did not advise any change in the management, deciding to leave the plantations under their founder and his native assistants, and they remained so till the former's death, when they were transferred to the Government Department.

The Conservator suggested that as the Blackwood, *Dalbergia latifolia*, had at that time an almost equal value to the teak, and the supplies being much exhausted, an experimental sowing of the seed of this tree might be made. The sowings should be made in a similar manner and at the same season as the teak. This tree, he said, appeared to be very hardy, and grew freely in almost every soil and situation on both aspects of the Western Ghâts. Cleghorn added that the plantations had been visited by both Lord Dalhousie and Lord Harris, who expressed in a Minute dated November, 1858, the high gratification he experienced in observing the result of Mr. Conolly's experiment.

On September 27th, 1860, the Conservator, in reply to a request for information on the subject of furnishing teak timber of large dimensions from the West Coast for Admiralty purposes, addressed the Government of Madras the following Memorandum on the subject of these plantations and the position of teak timber supplies in Malabar:

"The old forests of Malabar do not now contain much timber (first-class logs) of frigate scantling (i.e. 18 inches square by 38 to 32 feet long)." (This remark is worth comparing with the extraction of teak at the beginning of the century, *vide* Chapter VI, page 69.) "In North Canara there is an abundance of teak, but a small proportion only of the first class—probably not more than one log in eight of those brought to Sedashigur. In Travancore and Cochin there is much more teak of large size. We could supply from Malabar and Canara several thousand logs annually, varying from 18 inches square and 20 feet long to 10 inches square and 12 feet long. We have also a large number of first-rate butts 24 inches square and not exceeding 6 or 8 feet in length. For any demand for larger sizes I am sure Travancore and Cochin offer better prospects, and Burma the best, as regards size and cheapness.

inches. feet.		Per 50 cubic feet. £ s. d.
$18^2 \times 20$	..	8 0 0
$15^2 \times 20$	..	7 10 0
$12^2 \times 20$	..	7 0 0
$10^2 \times 20$	..	6 10 0
Butts $24^2 \times 6-8$	..	5 0 0

"On our coast the price of timber has very largely increased and fluctuates greatly; at present prices would probably run as entered above for timber brought to the water's edge. If a large and continuous supply is required for H.M. Navy, it would be advisable to establish an agency on the West Coast. The Bombay Government has now an Agent whose headquarters are at Calicut. If this officer could not undertake the duty, a separate Agent, on say Rs.400 per mensem, with an establishment of Rs.100 more, would be required. This officer would receive from our dépôts, or buy from private owners and ship the timber procured.

"Looking at the increasing scarcity, and the greatly augmenting demands for timber, I think Government should begin at once to plant freely. The Conolly plantations are now beginning to pay and promise well. I would urge the doubling of the grant for this. We now plant nearly 70,000 trees annually for about Rs.3000, which includes the care of those already planted; with Rs.6000 or only £50 per mensem, we could almost double the rate of progress and I am confident it would prove a good investment. I have explained my views to Lieutenant Beddome, who will arrange satisfactorily for this extension of operations, if Government sanctions it."

The annual cost of the establishment at Nilumbur at the time was Rs.3774 only. The budget for 1859-60 was as follows : Receipts Rs.4715 ; disbursements Rs.3011 ; surplus Rs.1704 ; a most satisfactory result after sixteen years' work only. The Government sanctioned Cleghorn's recommendation of an annual grant of Rs.6000 for the work, the Collector being of opinion that the returns from the plantations would equal this sum. Further, that 120,000 trees could be planted for this sum. It would also enable them to overtake the planting work which had got into arrears latterly, owing to the staff having had to give more time to the pruning and thinning work in the young plantations, which work was not then up to date.



THE NILGIRIS, SHOWING SHOLAS, PYKARA FALLS AND HEAVY FOREST ON RIGHT
From India Office Album



The following table, showing the financial results for the Presidency for the year 1859-60, also furnishes excellent evidence of the progress being made in conservancy under Cleghorn's energetic administration :—

FINANCIAL RESULTS OF CONSERVANCY FOR 1859-60.

NAMES OF FORESTS.	Receipts by the Sale of Timber, etc.	Disbursements including the cost of Establishment and Contingent Charges.			Balance in favour of Government.		
		R.	A.	P.	R.	A.	P.
Anaimalai	2,65,953 1 0	22,484 9 4			2,43,468 7 8		
Sigir	2,593 3 6	2,147 15 3			445 4 3		
Salem	29,482 6 7	4,040 6 6			25,442 0 1		
Canara, from May to December, 1859	87,921 0 11	29,037 9 10			58,883 7 1		
North Canara, from January to April, 1860	1,11,513 0 1	29,460 0 7			82,052 15 6		
South Canara, from January to April, 1860	5,069 1 10	907 4 3			4,161 13 7		
Nilgiri Sholas..	909 14 0	50 0 6			859 13 6		
Total ..	5,03,441 11 11	88,127 14 3			4,15,313 13 8		
DEDUCT GENERAL CHARGES.							
Pay of the Conservator of Forests, Establishment, Contingent Charges, etc.					21,722 12 3		
Actual Profit ..	3,93,591 1 5						

When Cleghorn proceeded on leave, Captain H. R. Morgan was appointed to officiate as Conservator, the staff at that time including such able men as Captain Michael and Lieutenant Beddome.

The origin of the famous Ootacamund Eucalyptus Plantations will now be briefly sketched.

In November, 1859, Cleghorn addressed the Government on the subject of the fuel supply of Ootacamund, the hill station in the Nilgiris, of Wellington and the other stations in the hills. He pointed out that for years past the woods, or "sholas," as they are termed, had been subjected to unrestricted fuel cutting by the residents and fuel merchants, and that were this practice to continue unchecked the firewood supplies would ultimately fail, whilst the beauty of Ootacamund would be seriously impaired. He instanced Simla as a case in point, stating that severe restrictions to indiscriminate

firewood cutting in the forests adjacent to that station had had to be introduced to safeguard the future supplies.

The sholas on the southern hills were Government forests, and the Government agreed to the Conservator's suggestions that the cutting of firewood by private persons should be forbidden ; that all the sholas in the neighbourhood of Ootacamund should be absolutely reserved, not only for their beauty, but also from fear of injuring the water springs ; that their limits should be demarcated and no private cutters be allowed inside ; that old trees should be felled by the forest staff and sold by auction outside, and that planting up should be undertaken as required.

It was also laid down that suitable woods at a distance from the station should be selected and marked out in lots, amply sufficient for a year's supply, the lots to be put up to auction annually. The buyer of the lots should be allowed to clear fell the trees on the lot, leaving those which might have been previously marked for reservation by the forest staff. These cleared lots would be replanted by the Forest Department. Finally, that no private felling of any kind, or for any person, would be allowed in woods or on land belonging to Government.

This was a move in the right direction, but it was recognised that it would prove insufficient to ensure the firewood supplies required. A certain amount of private planting on a small scale was being done, but this could not be relied upon to furnish the probable requirements of the future.

The first plantation made on the Nilgiri Hills was commenced by Captain Campbell on a site of 600 acres (purchased for Rs.700) within three miles of Wellington. By April, 1858, eight acres had been planted with *Acacia lophantha* (*pycnantha* ?), planted at first four feet apart and subsequently at six feet. The plants were raised in a nursery and put out as seedlings. The plantations were thriving, and sanction was given, on Cleghorn's recommendation, to continue the work. Captain Campbell had Corporal Hall, already mentioned in connection with the Anaimalai timber extraction work, as overseer, and somewhat later, on Campbell taking furlough, the corporal was placed in charge. Campbell had also pitted in at a much less outlay several species of hard woods on eleven acres of cleared land in a shola. This work had been started in order to ensure a supply of fuel for the troops at Wellington. Campbell was also using dried "turf," a kind of peat from the

bogs on the hills, which burnt excellently in mixture with wood, and was used by him for brick and lime burning. Cleg-horn strongly advocated the more extensive use of this peat to assist the firewood supplies, both in private houses, the barracks and by the Public Works Department.

Mr. E. B. Thomas, the Collector of Coimbatore, who spent some months each year at Ootacamund, had greatly interested himself in the planting question. He had planted 8000 Australian trees of different species at a cost of Rs.400, and the old denuded forests had been resown to a certain extent under the superintendence of Mr. McIvor, the Superintendent of the Government Gardens. The latter had asked for wire fencing for the new plantations as the only means of protecting them against animals, etc. The Government rather demurred at the expense this would entail for so bulky an article, owing to the long carriage necessary. The Conservator also suggested the planting of an avenue or belt of trees (where practicable) along the Ootacamund to Wellington and Avalanche to Sispara roads, and the planting of 10,000 trees in the vicinity of Ootacamund for ornamental purposes at a cost of Rs.1350. The Government readily sanctioned the latter "small sum . . . under the conviction that the outlay is trifling in comparison with the advantages to be derived from the proposed plantations, even in an economical point of view, and that it is highly desirable that an example of successful planting should be placed before the residents on the hills in each of the chief places of resort, as an encouragement to others to engage in an enterprise which, while it will be generally beneficial, will also be individually remunerative."

In a letter written at the end of December, 1859, the Conservator reported on the progress made. A part of the area secured by Campbell had been exchanged with the local villagers for a larger area of better land, which would bring the plantations when finished within a mile of Wellington, thus saving carriage; and, in addition, the area was served by two good roads to Conoor and Wellington. Another 90 acres had been planted since April, 1858, containing 2 lacs (2,00,000) of trees from three years to two months old, and another 8000 were being put in at the time he wrote, which would bring the planting season for that year to an end.

The average charges per mensem amounted to about Rs.125 exclusive of Corporal Hall's (who was now in charge) allow-

ances. It was expected that some return would commence to come in in about two years' time.

Cleghorn adds a footnote, obviously written later while on furlough, to his Government Memorandum, which is not without interest at the present day. It is as follows :

" In order that these plantations receive a fair trial on the mountain ranges of S. India, every facility for the periodical transmission of seeds from Australia ought to be afforded, and care taken that such transmissions are regular. The Horticultural Society, having had their attention drawn to Australian plants, laid particular stress on the importance of steady supplies of seeds." Such were the small beginnings of the now famous Ootacamund Eucalyptus Plantations which have so beautified the scenery of the hills, whilst proving of the highest economic utility.

The Nilgiri Hills were not the only locality in the Presidency where the fuel question was proving a serious difficulty. The city of Madras was experiencing considerable trouble in obtaining sufficient supplies of timber and fuel. Cleghorn dealt with this matter in a Memorandum written in 1859.

He drew attention to the valuable planting work which had been undertaken during the previous eight years on the banks of Cochrane's Canal, on a sterile soil and in an exposed situation ; the areas subject to salt-water overflow being covered with saline plants (*Salsola*, *Salicornia* and *Suaeda*) whose ashes afforded soda by incineration. The banks of the canal were lined with rows of young trees (*Casuarina*, *Melia* and *Pongamia*). The Palmyra palm grew spontaneously in vast abundance along the narrow strip of land between Pulicat Lake and the sea. Other trees began to appear at some distance beyond Coromandel, " where the tract of jungle under consideration increases in breadth " ; but the trees were nowhere of large size, and there was no part which could be designated forest, the general appearance being that of a dense, scrubby jungle. The length of this belt was, he said, forty miles, with a varying breadth of a mile to about eight miles. The loose sand in this region was blown about by the wind and tended to form dunes along the coast ; at the edge, where there was a considerable depth of loose sand, the Caldera bush or Screw Pine (*Pandanus odoratissimus*) grew in abundance, fringing the line of dunes. The Conservator considered that the possibility of converting this waste tract into culturable land was remote, and he recommended that it should

be retained as a reserve for the production of fuel and beams for house building, and thereby be of important use to the community.

He pointed out that a large city like Madras required much fuel for daily consumption, and that the sources of supply could not be exclusively confined to mountainous or uncultivable land. Difficulty was experienced in supplying the market with timber and firewood, and the scarcity of fuel had long induced the poorer inhabitants to resort to the Striharikota firewood jungle in Chingleput. Here, in addition to felling stunted trees, underground roots and stems, running along the loose sand, were pulled up with ease and used as fuel. The Military Board had stated that at least one half of the fires in Madras were fed from this source. However convenient this source of supply of firewood was to the Madras traders as well as the poorer residents, Cleghorn pointed out that the destruction of the shrubs, roots, etc., would result later on in a serious inconvenience to the public, over and above the loss of the supply itself, which must eventually cease to exist. This would prove a source of detriment to the canal, as it would revert to a desert state, and the dry loose sand of the isthmus be drifted into the canal and spread over the adjacent country. If, on the contrary, an opposite system be pursued, and the growth of trees and shrubs be encouraged, the belt of wood will protect the soil from sweeping winds and afford fodder for cattle." Cleghorn therefore recommended that Striharikota should be reserved and that a commencement should be made with the systematic planting and reclaiming of the sandy flats or dunes which ran along the coast between the canal and the sea. There appeared to be no obstacle to effecting this since, he argued, that what Nature had done in Striharikota indicated the lines upon which the coastal tract could be dealt with. He instanced Pulicat as he had known it fifteen years previously, when that old Dutch station was almost without a tree, whereas now there were avenues and ornamental shrubs round the fort and on both sides of the backwater.

On the subject of the area necessary to produce a continual supply of firewood for the 70,000 population of Madras he had no data on which to base a calculation ; nor any as to the length of the time it would take to grow it ; but he was of opinion that although seven years was found to be sufficient to produce this class of material on the West Coast, it was too

short for the growth of hard wood on the East Coast. The species to choose would be those which grew rapidly and would sow and extend themselves naturally, indigenous trees being preferable to exotics, the exception at Ootacamund, where exotics were being introduced, not being relevant to the plains area.

Cleghorn insisted that all that was wanted was conservancy, "in order to prevent tracts from being completely cleared, to hinder people from injuring the roots and to make suitable arrangements for the removal of trees cut down." He prescribed that a certain number of standard trees per acre, thirty to forty, should be left to provide shade and seed, instead of "shaving off everything to the root by which means both the medicinal products, as well as the larger fuel, will gradually but certainly disappear." These suggestions for the treatment of the Striharikota Forest were accepted by the Government.

On the question of measures to be adopted for increasing and extending the growth of tree plantations, the Conservator made the following suggestions :

(1) That the planting work which had been already commenced by the Department of Public Works on the banks of the Northern and Southern Canals might be considerably extended, and would then afford an excellent example to private persons. The broader the belt, the greater would be the protection afforded to the outer rows of trees, which would attain a better height and growth. A broad belt would be of value in preserving the bank, as well as the water in the canal, whilst the loppings and prunings would probably repay the cost of planting. Cleghorn instanced the planting work that had been carried out on the banks and cuttings of the Ganges Canal as a case in point. In his Report on this latter work Colonel R. Baird Smith had shown that a considerable revenue had been derived from the culture of trees on this canal.

(2) The Conservator suggested that the Collector should encourage the heads of villages to take an interest in planting topes (clumps of trees) by holding out the promise of a reduction of land-rent whenever so many hundred trees, in a flourishing state, had been raised and assurance was given that the tope would be maintained. This course, said Cleghorn, had been adopted in Mysore and in some parts of Bengal with considerable success.

The topes of trees which are so common a sight in Bengal in connection with the villages were alluded to in the paper published in the *Proceedings of the British Association* (*vide* p. 215). But they had been often mentioned in the writings of visitors who travelled in that Province in the early years of the century. Bishop Heber, in his *Narrative of a Journey through the Upper Provinces of India, from Calcutta to Bombay, 1824-5*, frequently alludes in his journeying up the rivers from Calcutta to the topes, as, for instance, "a good many villages in sight, each with its adjacent wood," and "the country was extremely pretty, the high banks being fringed almost down to the water's edge with bamboos, long grass and creepers, and the shore above covered with noble bannians, palms and peepuls, with many neat villages under their shade."

(3) The Public Works Department could only be expected to plant close to the canal, and the villagers in the immediate vicinity of their villages. Many failures of plants put out might be expected in the first year; but the Conservator anticipated that with perseverance the work would result in a large supply of wood near Madras, with water carriage to bring it to market.

(4) Cleghorn advised that at the close of the existing leases it would be inadvisable to continue the system, only lately adopted, of renting out an eighth portion of the forest *to be cut down to the ground*. He suggested that the trees should be pollarded only at 6 to 8 feet from the ground. The lateral branches secured from the pollards would be more numerous, he contended, and yield a larger amount of firewood.

(5) He did not consider that these waste lands could be profitably planted by Government with a fixed establishment for the sole purpose of raising firewood; but he adds: "A resident cultivator holding a lease of these waste lands rent free for a certain number of years, and planting Palmyra palms for shelter close together, so as to encourage the growth of coppice within, would receive a fair return for his labour, and little or no professional skill would be required."

In another Memorandum (5th April, 1859) the Conservator drew attention to the minor jungles of the Presidency generally, pointing out that their supervision was not contemplated three years before in the original scheme of the Department; nor so far as he was aware had they been taken into systematic consideration in Bombay or Pegu. These jungles had been

hitherto either unprotected by any Rules whatever or left to the management of the local authorities. He instanced the Rules in force for the management of the Sind preserves, which supplied fuel to the Indus Flotilla and also the Simla Rules. Cleghorn continued : " In almost every district of this Presidency there have been references in regard to firewood and bamboos, which are subject to various rules in the different Collectorates and the question is frequently asked by private individuals, ' What is the best kind of tree to grow for firewood ? '

" There can be no doubt that, in the neighbourhood of large towns, along the lines of railway, in the vicinity of iron foundries, sugar factories, engineers' workshops, etc., this necessary of life is more scarce and expensive than formerly, owing to the greater distance from which it is brought, and the unrestricted licence with which it is cut.

" The marvellous changes which are taking place will probably render new regulations necessary for the continuance of the supply. The consumption of fuel is very great near some of the works alluded to. It is not far from the truth, that four sugar factories (Astagram, Aska, Chittavalsa and Rajamandri) burn from 10 to 20,000 tons each in the working season ; and the railway demand for sleepers requires 20,000 tons for every fifty miles under construction, besides other factories and great works hastening the clearance of the jungles.

" One thing seems evident, that in future incorporated bodies must plant quick-growing trees for their own use, and begin early, so that no time may be lost, and the trees be coming on whilst the preliminary operations are in progress. It would be well if such companies take up so many acres of land at each station where they have a European officer.

" So great has been the demand for wood and fuel in the vicinity of the railways, that zamindars have raised the Kuti kanam or stump money, and have levied a tax on every cart of firewood, seldom less than As.2, and very often As.4. On the other hand, the Board of Revenue, Pro., 19th June, 1858, No. 2131, recommend a liberal policy, laying down ' the principle of leaving the fuel of the inhabitants of a district untaxed,' unless the collector can show special reasons for the restriction ; and more recently the Government abolished the jungle rents in several districts (petty items of

Pullari). The natural effect is, that the consumption of fuel is greater in Government jungles than it has ever been. I cannot but think that the Government have done wisely in abolishing the variety of small taxes usually levied by native proprietors on jungle products; planks, ploughshares, fuel, oil-grasses, gums, honey, resin, arrowroot, having all different imposts levied upon them, giving opportunities for extortion and obstruction of trade.

" It must, however, be observed that the abolition of these jungle rents and petty imposts tends to the extirpation of many drugs and dyes, and to the diminished supply of fuel, which is maintained by the levy of a small seignorage.

" The products which require the destruction of the tree should be reserved in any agreements made with contractors to prevent extermination, such as Satin-wood, Sandal-wood, Red-wood, bark of *Acacia leucophleæa* (used in distilleries), Catechu. Those which yield articles of produce taken without injury to the tree, as tamarind pods, soapnuts, guavas, custard apples, etc., may be rented separately, and with less fear of exhaustion. Also gums and gum-resins, as kino, gamboge, dammer, etc.; also alliaku leaves (*Memecylon tinctorium*) (*M. edule?*) kapila-rang, sika-kai (*Acacia concinna*), etc.

" The subject of firewood is surrounded with many difficulties; the European merchant, the cultivator of the soil and the sepoy, are all deeply interested in a cheap supply of this necessary of life, essential to the poorer classes; and the consideration of the question requires much attention, and very careful proceedings.

" The circumstances of particular districts vary so much in regard to indigenous supply and local demand, that it appears to me impossible to lay down rules which admit of general application.

" The forests of Malabar and Canara still abound in fuel whilst the jungles of the East Coast are generally small and stunted, except the mangrove belts of the Godavari and Kistna deltas, and the woods of the moist climate of Orissa, where there is a more rapid growth of luxuriant vegetation. Here clearing is advantageous to the increase of cultivation and the easy access of troops. In other parts of the Presidency there are vast tracts of scrubby jungle in excess of local demands, but these are generally at a distance from roads.

" To illustrate the varying circumstances of different dis-

tricts let us take Madras, Mangalore and Utakamand (Ootacamund). The rules which experience has suggested for any one of these are unsuitable to the other two.

"In Madras, according to the published records of the late Military Board, the consumption of firewood and charcoal was estimated in 1852 at 98,652½ tons per annum. This has increased much as railway operations have advanced, while the source of supply has diminished. The spontaneous reproduction of neighbouring jungles being inadequate for the purpose, the deficit has been made up from a distance by increased facilities of communication.

"In Mangalore, the capital of a wooded district, the price is high, owing to *external* demand. At the auctions, the lots are greedily bought by country traders for Bombay, Karachi, etc., and the sale of firewood in Canara thereby yields a very considerable revenue.

"In Utakamand, the ripe trees of the indigenous sholas are sold by auction, fetching a small return (Rs.20 or 30 per shola). As the influx of settlers increases, the original tree vegetation will disappear entirely, prohibitory rules will be futile, and then proprietors will plant according to their own requirements, and a few probably for profit. The experimental plantations of Government show that this may be done successfully.

"The consumption of firewood for cooking and artificial temperature is much greater in the hill stations than in the Carnatic; indeed, the consumption may be expected to increase in the ratio of the altitude.

"I have been asked to lay down conditions of management for the firewood jungles of Strihrikota and the sholas of Utakamand. It is necessary that they should be very simple, or they will be inoperative. The native lessees are ignorant and unscrupulous; and unless the conditions be made penal under the new police, all forest rules will be violated with impunity.

"To furnish rules for the economical conservation of the Strihrikota and other small jungles is a difficult matter; but my former Memorandum tended to prove, that the system of renting and sub-renting lately commenced had been highly prejudicial to the jungles, and oppressive to the people. I had reason to mark that it was so in Strihrikota; and I have no doubt that the same system is attended with the same results in Nellore and Guntur, and other districts, from

which supplies of firewood are conveyed to Madras. The renters assume great pretensions, and, if not watched, levy cess on the villagers in the neighbourhood, and on the boats plying in the creeks.

"The least objectionable course, in my opinion, would be to throw the privilege of cutting, and the duty of maintaining, the jungles on those who can perform both at least cost, and are most interested in their preservation, viz. the villagers. No tax should be levied from them but upon the cargo, as I believe was the system formerly.

"The next question is the mode of preservation and improvement, so as to keep up the largest supply on the ground. I think the best arrangement is, to reserve thirty standard trees to the acre, preferring such as are valuable for fruit, leaves, gums, or medicine. Cuttings to be made once every 8 years to be followed by sowings. Whenever salt-water tidal creeks occur, with muddy banks, seeds of the mangrove tribe, common to such localities, should be sown.

"The villagers will probably do this if properly encouraged ; the Palmyrah (*Borassus flabelliformis*) has increased very much by their means ; the babul (*Acacia Arabica*) and punga (*Pongamia glabra*) grow and germinate freely, and cattle do not touch them. They will undertake the sowing of these with the dirisana (*Acacia speciosa*), if a word of encouragement is given by the Collector, his assistants, or other Europeans.

"I may mention that, in particular districts, the names of certain civilians are long remembered in connection with the planting of topes and trees. For instance : Mr. Orr, Salem ; Messrs. Sullivan and Thomas, Coimbatore ; Mr. Robertson, Bellary ; and Mr. Rohde, Guntur.

"For the Striharkota or other small jungles near the sea-shore, the following simple rules might be observed ; and the valuable trees enumerated below should be reserved in all districts :

"I. Trees reserved for the value of their timber.

- | | | |
|------------------|---------------------------------------|--|
| 1. Sandal. | 8. Jack. | 14. Babul. |
| 2. Red Saunders. | 9. Acha maram. | 15. Sirissa (<i>Acacia speciosa</i>) (<i>Albizzia Lebeck?</i>) |
| 3. Ebony. | 10. Marda. | |
| 4. Satin-wood. | 11. Common Terminalia. | |
| 5. Teak. | 12. Glabrous Terminalia. | |
| 6. Blackwood. | 13. Kadam (<i>Nauclea cadamba</i>). | 16. Catechu. |
| 7. Palmyrah. | | |

" II. *Trees or shrubs reserved for the value of their products.*

- | | |
|--|---|
| 1. Custard apple. | 7. Tetancotay (<i>Strychnos potatorum</i>). |
| 2. Guava. | 8. Surul Chaki (<i>Ventilago Madraspatana</i>). |
| 3. Soap-nut. | 9. Sikai-maram (<i>Acacia concinna</i>). |
| 4. Capila-rung (<i>Rottlera tinctoria</i>) (<i>Mallotus philippensis</i>). | 10. Pinné (<i>Calophyllum inophyllum</i>). |
| 5. Ilupé. | 11. Tamarind. |
| 6. Cashew-nut. | |

" The rules are : (1) Avenue trees not to be cut. (2) Trees cherished by villagers not to be cut. (3) Thirty standard trees to the acre to be preserved. (4) The stem not to be cut lower than two feet from the ground, the highest point to which the driftsand will probably reach. (5) A fringe next to the sandy beach to be left untouched. Great care should be taken not to lay bare spots of more than one hundred yards width ; and the clearances should be made parallel to the seashore, or the part from which the sand drifts in, and an uninterrupted belt of jungle should be left all round.

" These remarks do not apply to uninhabited forests, where there is useful timber, and where there are no local rights to be considered, but to frequented tracts of inferior jungle or brushwood, where there is a constant pressure for fuel.

" *Taxing of Timber.*—In the Government forests of the West Coast, whilst ryots retain their privileges, the mercantile classes are referred to the depots, and supply themselves at the periodical auctions, and occasionally obtain by permit a specified number of trees marked by the Conservancy Department at a fixed rate, varying from As.8 to R.1-8-0 per tree for house-building.

" In Salem lately, with the concurrence of the Collector, and in accordance with the Bombay rules, R.1 per cart was charged, at the outlet of the Kotapati and other valleys, for wood exported for building purposes. I found, on inquiry at Vaniambadi and Vellore, that the average value of such cart-loads of timber is Rs.5 to 6 ; the charge, therefore, seems reasonable, and is readily paid. I consider that a similar charge will be necessary for the protection of all Government forests along the line of the railways, more especially as zamindars have increased their imposts on all wood from their forests.

"*Palmyrahs*.—In regard to these, I am of opinion that their preservation and increase should remain in connection with the Abkari department.

"*Bamboos*.—Bamboos for exportation are allowed to be cut below ghát at a charge of Rs.5 per 1000 for all sizes; and those granted above ghát (independent of those taken for exportation) are divided into four classes, according to size.

"Bamboos are valuable according to their position (vicinity of large towns); sometimes they are of no value, and it would not be just to fix a common rate. In Gumsur and Kimadi, it has been considered desirable to get rid of the bamboo jungles. In Salem and North Arcot they are rapidly becoming scarce within ten miles of the railway, and the question of subsequent management has been under the consideration of the collectors and myself. Bamboos are exported largely from the Shevarai Hills to Trichinopoly and Madura, and the trade is said to be lucrative.

"In conclusion, it will be seen that vast changes take place in a few years, and that it is impossible to lay down absolute rules for general application. The subject of fuel requires close attention, both as regards household requirements, climatic changes and mercantile considerations; and in remodelling the rules of any particular district, the full concurrence of the Collector should be obtained, and due respect be paid to private interests."

The Government of Madras approved generally of the above recommendations and in sending them on to the Board of Revenue to be given effect to the Government remarked: "As population increases and cultivation extends the subject of maintaining the supply of firewood becomes very important. In more advanced countries it is recognised as one of the modes of employing capital for profit, to maintain plantations for the purpose. India has not yet reached that state; but the time is approaching when a commencement of that system will be necessary in the neighbourhood of large towns and extensive factories. The terms on which land may be had for planting are so liberal as to offer no obstacle; but planting for this purpose is novel in this country, and there is the usual backwardness to make a beginning. The Board and the various Collectors may be able to aid in removing this feeling by inducing men of more than usual intelligence and enlightenment to take the lead. This is particularly desirable in the neighbourhood of Madras. The attention of the proprietors

of factories and of the Chief Engineer should be drawn to Dr. Cleghorn's remarks. This important subject should be everywhere attended to."

It thus becomes apparent that Cleghorn's broad views, great energy and tact and the liking with which he was universally regarded, had at length opened the eyes of the Government of the Presidency to the real position of affairs as regards the timber and fuel supply question.

As showing that effect was given to the Conservator's recommendations we find that in June, 1860, Government authorised the levy of a payment of annas 4 per cartload of about 750 pounds for the privilege of cutting firewood in the Government jungles in the district of Trichinopoly. The rate was to be paid by the East India Iron and Steel Company and other parties not belonging to the village communities. The order also applied to the Government jungles in South Arcot, where the Company's lease had expired.

The Conservator wrote an interesting Memorandum on the Godavari timber, upon which the Collector, Mr. G. A. Smith, had reported in August, 1838 (*vide* p. 77). The great dépôt for the Godavari teak in Cleghorn's time was Koringa, where many vessels were built; yet even there it was found more profitable to plank vessels chiefly with teak brought from the opposite coast of Pegu. Either from want of transport or from long custom the wood-cutters about the Godavari cut short almost every log to a length of 18 or 20 feet, and cut away one-half of the thickness of the finest logs, leaving three projecting pieces, which were pierced to serve as dragholes for conveying the timber from the forest or lashing it together in rafts. The Conservator suggested that an excessive duty should be placed upon all timber so treated to put an end to the practice.

The forests in the valley of the Savitri (Sebberry) and the country between it and the Indrawati had been investigated and reported upon by Captain Fenwick in 1850. No large teak were found, and forests of sal of various dimensions were, says Cleghorn, "almost all that Fenwick reported." In 1856 Mr. Tuke was sent to explore the Savitri River. He reached a forest about 130 miles from the mouth, in which he estimated there were 800 good teak trees in the neighbourhood of Kannirirada. He met trees measuring 11 and even 15 feet in girth, and from 30 to 45 feet in length, proving that the teak grew to its full size in that country. Mr. Tuke wrote: "much

teak may be found in the Suncham taluk growing in patches," and was informed that the Dorapalle and Gollapalle pargannas were most abundant in teak wood. The Rissildar, in command of the Rajah's Horse there, informed him that large teak was abundant all along the banks, and in the neighbourhood of the Indrawati, but that it had never been cut, owing to the obstructions in the river, which prevented its being brought down.

Mahadeopuram, on the right bank of the Godavari, was the great dépôt for Secunderabad; large rafts came down from the Ahiri Forests (Chanda District, Central Provinces, the teak forests of which had been, and still were being, wastefully hacked about) by the Varada and Indrawati Rivers. The timber, 18 feet long by 1 cubic foot square, was carried to Secunderabad on carts for building purposes. In conclusion, Cleghorn added that detailed information regarding the teak forests in the Godavari Valley was still wanting.

In a note subsequently added to the Memorandum the Conservator wrote that Captain Stoddard, in a letter dated October, 1859, stated that "there is an abundance of the very finest teak growing between the Severi and Indrawati Rivers, which might by European enterprise be brought down to the Severi which he considered quite navigable for boats drawing from 5 to 6 feet from June to November." The Conservator mentions that Lieutenant R. H. Beddome, Assistant Conservator of Forests, had prepared an accurate and useful list of the timber trees which he met with in the Hyderabad portion of the Godavari Forests.

In January, 1859, Cleghorn paid a visit to the Northern Circars, and made his first acquaintance with the sâl forests. He discussed with the Collector, Mr. W. Knox, the question of the sâl forests of Gumsur. The Collector "urged the propriety of some measure being adopted for the due economy and preservation of the forest timber of this district." The attempts hitherto made to extract timber from these forests had not proved a success. In 1851 Mr. G. Williams had entered into a contract to supply railway sleepers, this being the first attempt to work the sâl forests of the Northern Circars. The wood was found to be superior, but the contract failed.

Overseer Harton felled and dispatched sâl wood from Cuttack (in Bengal) to Madras, on account of the gun-carriage factory, and Overseer Weldon was engaged on the same duty

in the Sambalpur Mohals in 1859-60, but was recalled shortly after Cleghorn's visit to Gumsur, owing to the difficulties he encountered in endeavouring to get the timber required. Cleghorn states that with these exceptions, "I believe that no systematic operations have been attempted."

One of the reasons for the difficulty experienced in endeavouring to commence the exploitation of the sâl forests, in his own division, was expressed as follows by the Commissioner of Cuttack in 1851: "There is much difficulty in getting timber of the dimensions required by the gun-carriage factory. The largest trees near to the river have been removed, and the Rajas do not evince a willingness to cut those in the more distant forests, and require much persuasion to induce them to afford the requisite aid, without which no timbers of the desired dimensions can be procured. Again, the labour of the coolies employed by the Rajas to remove the timber is compulsory and unremunerated. On the other hand, if they be employed by the Agent, the Raja or his servant exacts a portion of the hire. They are therefore not over-willing to lend a helping hand."

Cleghorn marched through the Gumsur sâl forests and noted that the rivers traversing them would permit of rafting the timber out. He corroborated Falconer's remarks about the wasteful use of the sâl (*vide p. 105*) of all ages, from five-year-old saplings upwards, for every kind of purpose. He also notes on the prolific seeding of the tree, and the dense masses of saplings which came up on the ground if a few old seed trees were left to provide it. "With this heavy drain (in felling) on the forests, young plants spring up in profusion, and often so thick as to choke each other." Cleghorn also made a similar statement to that of Falconer, that "there is no fear of exterminating the forest provided a few trees remain as standards per acre, to perpetuate the stock." He noted that "large patches of sâl forest are cleared annually for the purpose of cultivation, and this is usually effected by fire. I came upon several places where some hundreds of fine straight charred poles were standing."

On the subject of the Gangam sâl forests Cleghorn said that the district required opening out. There was an abundance of wood. All that appeared necessary was to reserve the sâl and a few other superior woods confining the firewood-cutting to the woods of less value. A good bridged cart road ran from Gangam to Russelconda. A road from Russelconda

had been cleared up to Durgaprasad, near the foot of the Kalingia Ghát. The Konds came down once a week to the market at Belligunza, bringing oil seed, wheat, tumeric and a little cotton ; they returned the following day. Captain Harrington was engaged in erecting a large rest house for them. It was intended to continue the road to Sambalpur, where it would join the high road to Nagpur. The road track ran through the sâl forests, but kept to the high ground, whereas the best sâl was at the lower levels.

This record of the position of the forests of this portion of Northern Madras and the south-western corner of the Bengal Presidency at this period is of interest. Cleghorn sums up his opinion on the forests as follows :

"The sâl forests of Gumsur are the most valuable tract of wood on the eastern coast, and the only one I have seen which would repay European superintendence ; still it scarcely ranks in value with a second-class forest of the western coast. Perhaps there are parts of Rajamandri and Masulipatam which may hereafter contain teak of more value than the sâl of Kimadi and Gumsur ; but at present there is nothing left on Government land save seedlings of comparatively small girth, the Godavari River banks having been cleared, and the best wood exhausted. In consequence of the unhealthy climate of Gumsur, and the difficulties which would be experienced by European or Eurasian overseers, I think the work of felling and preparing rafts should be organised at Gangam." The operations Cleghorn outlined as divisible into three distinct stages : (1) Felling and transport of the logs to the river bank. (2) Floating the rafts to a dépôt at Gangam. (3) Shipping timber to Madras.

At the same time he was not prepared to propose any establishment to undertake the working of these forests at that time !

Sâl timber, at this period, had still to make its way into the southern markets against its all-powerful but rapidly disappearing rival, the teak !

In Mysore a separate Forest Department was inaugurated, Major A. Hunter being appointed Conservator on 11 January, 1864. Lieutenant G. J. van Someron was appointed 1st Assistant Conservator in this department on 4th May, and placed in charge of the Ashtagram and Coorg Ranges. Lieutenant E. W. Miller was appointed 2nd Assistant Conservator in July, 1864, and appointed to the charge of the Nuggur

Range, and two other assistants were appointed in the following year.

The Conservator and his assistants spent the year 1864-5 in making themselves acquainted with the large districts under their charge, in framing new Rules and establishing office procedure. So that little in the way of real forest administration was carried out before the close of the period here dealt with.

On the expiration of his furlough at home Cleghorn returned to India in November, 1861, and was sent to the Punjab to report on the forests of the Western Himalaya, as will be elsewhere described.

In January, 1864, he was associated with Brandis, who had been summoned from Burma in October, 1862, to advise the Government of India in the general organisation of forest administration. On Brandis' recommendation Cleghorn was placed on deputation to assist in this work, a signal recognition of his good work in organising the department in Madras. Cleghorn remained in this capacity till March, 1865. Whilst still on deputation in the Punjab Forests, Brandis and Cleghorn had drawn up in August, 1863, a joint Memorandum submitted to the Government of Madras, on the subject of the forests of that Presidency. The Memorandum urged the necessity of the early demarcation of the Government and village forests of Madras. These proposals were not, however, at the time approved of by the Madras Government. In spite of the persistent representations subsequently made on the same subject by the Government of India, no adequate action was made in Madras towards effecting a separation of the various rights and interests in the public forests and waste lands until the Madras Forest Act was passed in 1882.

Cleghorn laid the first foundation of an effective system of Forest Conservancy in Mysore and Madras, as was publicly acknowledged by Brandis, at a time when Forestry was very little known in India. A public Resolution by the Government of India of 10th January, 1865, justly designated Cleghorn as the "Founder of Forest Conservancy in India," and added:

"His long services from the first organisation of Forest management in Madras have without question greatly conduced to the public good in this branch of the administration; and in the Punjab also Dr. Cleghorn's labours have prepared the way for the establishment of an efficient system of conservancy and working of the forests of that Province."

CHAPTER XIX

THE INITIATION OF FOREST CONSERVANCY IN THE BOMBAY PRESIDENCY AND SIND, 1858-1864

THE history of the attempts made to introduce some form of Forest Conservancy for the protection and amelioration of the forests of the Bombay Presidency from 1838 onwards, has been traced in previous chapters. The aims of the Government, as laid down on paper, should, had they been given practical effect to, have achieved a considerable improvement in the management of the forests. Their Conservator, Gibson, was able to make some progress. He appears to have confined his energies, during the ten years he held the post of Conservator, to three main objects, and his tours in the forests seem to have been undertaken to attain them. These were the prohibition, so far as possible, of Kumri cultivation, in which we have seen that by 1859 the practice had been very nearly stopped in the forests of the Presidency. In Belgaum the following Rules had been introduced: 1st, Kumri cultivation is absolutely prohibited, except within four miles of the ridge of the Ghâts in the Bidi taluk, and within two miles of the ridge in the Padshapur taluk. 2nd, Within the said limits, no timber trees, whether large or small, are to be cut down for clearing Kumris, and no ground within the said limits is to be cleared for Kumri without the written permission of the district officers. In the Dharwar Collectorate the practice was said to have been entirely stopped. Gibson's second object was to institute thinnings amongst the young teak areas in the reserves, and to commence forming teak plantations; and the third to carry out a systematic study of the results of the denudation of the forests on the climate of various localities, and on the water supplies in these areas, together with the results perceptible in the drying up of springs and streams, and the silting up of rivers and harbours on the coast.

From the correspondence it becomes apparent that Gibson

experienced considerable opposition to the introduction of conservancy from the Collectors of the districts, who were, as a body, strongly opposed to the advent of a new Department who would take over the management of the forest portions, and with them the revenue, of their districts. The divided control, which was in the hands of several departments, also resulted in great confusion and in little real progress in conservancy ; whilst the accounts of the Department and the supervision of the methods by which the revenue was collected were in a deplorably chaotic condition.

One of the main reasons for the position into which the Department had drifted was to be attributed to the inadequacy of the establishment when contrasted with the area it had to control. The Conservator had only one assistant, a small office establishment and a staff of Foresters, whose total monthly pay amounted to Rs.358 only. "It is only by turning to account, here and there, the services of the carcoons and peons (who, it will be remembered, were employed in the collection of the fees for forest materials in transit from the forests, p. 220), that the Conservator had been able to exercise any watch over the forests, or provide in any manner for their conservancy. In the Tanna Collectorate and elsewhere, wherever the right to collect the fees was farmed, no such assistance could be given to the few peons and foresters employed to watch the forests, and the general result of this lax system has been most serious on the forest resources ; it being the general complaint everywhere, that all valuable timber has nearly disappeared, and that the supplies of firewood and other timber are being rapidly cleared away.

"Owing to the growing scarcity of timber, and the extensive demand for wood of all descriptions for building and railway purposes, prices have within the last few years so risen as to hold out immense temptations to everyone permitted to fell timber, or to enter the forests, to turn their opportunity to the best account. Not only is timber clandestinely removed from the forests, but the felling is conducted in the most reckless and wasteful manner, and to such an extent has the devastating process been carried that serious apprehensions are entertained that if the forests are not more strictly conserved than they have hitherto been, and the Conservator's Department placed on an efficient footing to cope with the evil, the supplies of timber will fail altogether" (*Resolution of Bombay Government*).

Comment on the above is unnecessary: for the true position of affairs in the Bombay Presidency could not have been more mercilessly exposed than is the case in the above Resolution.

The Collector of Dharwar, Mr. Goldfinch, brought the matter prominently to the notice of Government in a letter dated June 20th, 1860, in which he gave a melancholy account of the denuded state of the forests in that Collectorate, since he had last seen them eight years before. In consequence of this representation Government (26th December, 1860) directed Mr. Dalzell (who had been promoted from Forest Ranger in charge of the Sind Forests to succeed Gibson as Conservator of Forests in Bombay) to meet Goldfinch, and in conjunction with him to draw up a set of rules for the better conservation of the forests. Mr. Tucker, Collector of Belgaum, and Captain Anderson, Superintendent of the Revenue Survey, South Mahratta Country, were associated with them on this duty.

In submitting the Rules which had been agreed upon by Dalzell, Anderson and himself, Goldfinch remarked on the destructive system of management in the Forest Department, where the selection and cutting of the timber was left almost entirely to contractors, whose interest it was to fell as much, and only such timber, as suited their purpose, to the great injury and detriment of the forests, and he suggested that the Forest Department should be entirely relieved of all conservative duties, as also of the duty of conducting the sales of timber, and keeping the accounts, and should be restricted to the professional duties of marking and superintending the felling of marked timber.

The Bombay Government (August, 1861) gave their approval to the principle on which the Rules were drawn up by Goldfinch and Dalzell, and sanctioned their extension to all Collectorates. Under these Rules it was decided that the entire forest establishments of each Collectorate were to be under the control of the Collectors, who were to supervise the sales of timber, and keep the accounts relating to the forest management of their Collectoroates, whilst the duty of the Conservator was to consist in annually visiting the forests for the purpose of advising the Collectors, and offering such suggestions for the management of the forests within their respective charges, as might appear to him desirable. Each Collector, Government considered, ought to be assisted by an Assistant

Conservator, under whose more immediate supervision the forest establishments of the Collectorate should be placed, and they directed the acting Conservator to submit, in consultation with the two Revenue Commissioners, proposals for a re-organisation of the forest establishments on these principles.

Before considering the proposals put forward for the re-organisation of the Department it will be necessary to glance at the correspondence which took place at this time between the Secretary of State and the Governor in Council, Bombay, on the subject of the forests.

The Government of Bombay had addressed two communications to the Secretary of State detailing the steps they were taking to improve the conservancy of the forests. The Secretary of State had commented adversely in a Despatch (July, 1861) upon the want of co-operation exhibited by officers of the Revenue Department towards the Department of the Conservator of Forests. The Government of Bombay in reply had referred the Secretary of State to the proceedings of their Government, sanctioning new Rules for the management of the forests, and a fresh distribution of duties between the two departments. The Secretary of State (February, 1862) remarked : "In these proceedings, whilst you fully admit the justice of the complaint brought against the Revenue Department, you have impressed, in very proper terms, upon the Collectors and their subordinate officers, the necessity of active attention to this important part of their duties.

"I sincerely trust that the changes here reported in the administration of the Forest Department, joined with the very strong expression of your opinion of the importance to the country of a due conservation of the forests, will have the effect which you anticipate in preventing similar complaints for the future. The annual visit of the Conservator to the forests I look upon as a highly important feature of the new Rules; but he should, as it appears to me, be accompanied by one of the subordinate revenue officers of the district. I am not, however, sanguine of the success of that part of the plan which places both establishments under the control of the Collector, after the past experience of the indifference shown by some Collectors to the interests of the forests. You have, however, adopted it on the recommendation of Mr. Goldfinch, Mr. Dalzell and Mr. Anderson, the Commissioner, and I sanction the experiment, and only express this doubt in order to impress upon your Government the necessity of

narrowly watching the conduct of the Collectors in this branch of their duty.

"A strong proof of the evils resulting from neglect of the orders of Government occurs in paragraphs 28 to 33 of the Annual Report, in which Mr. Dalzell describes the devastation which has taken place in the Bedee Talooka, from the practice of Kumri, and the destruction of the green wood jungles, the preservation of which had been strictly ordered. This, it appears to me, could not have happened without culpable negligence on the part of the Collector of the district and his subordinate officers ; and you very properly called for inquiry into the circumstances.

"With respect to the remarks of Mr. Dalzell on the subject of the reluctant sanction given by your Government in October, 1858, to the practice of Kumri cultivation, I wish to remind you that my approval of the resolution of your Government referred to, and of that of the 10th January, 1859, in my Despatch of the 20th September, 1860, No. 30, was given on the understanding that it was only permitted where its abolition would be oppressive to the poorer classes of cultivators, whose only means of sustenance was derived from this source. I am of opinion that, wherever practicable, this system of cultivation, and that of Dullee, which appears to be almost as mischievous, should be entirely prohibited, as it is now in other parts of India, where it has been found to be both morally and physically pernicious to the people, as well as ruinous to the forests ; with respect, also, to paragraphs 22 and 23 of Mr. Dalzell's report, the Collectors should be enjoined to use their influence against the practice as much as possible with private proprietors who allow it on their estates.

"By your proceedings of 24th September, 1861, No. 1955, I perceive that you very properly explained that those Rules were applicable only to forest lands.

"The working of the new mode of collecting fees in the Tanna Collectorate, as related at the beginning of the Annual Report, seems to have been very satisfactory, and I hope that the steps referred to in paragraph 11 of your Resolution of 11th October will stop the depredations which have been committed under cover of passes from Inamadars."

"The measures taken, on Mr. Dalzell's recommendation, to put an end to the mismanagement and waste of timber in the dockyard stores (a timber dépôt under the Forest Depart-

ment had been formed here in 1854), so often the subject of correspondence and of animadversion in the Despatches from this country, seem likely to be effectual for that object. The imposition of restrictions on the destruction of Ainee (*Artocarpus hirsuta*) and Khair trees for firewood in this season was very proper, and should be adhered to until the forests yielding those trees have recovered from their exhausted condition. The ainee tree appears likely to prove a valuable substitute for teak. You will not fail to communicate to me, and also to publish for general information, the result of the inquiry which you have ordered into its merits."

It fell to Captain (afterwards Colonel) R. L. Bingham, who was acting Conservator of Forests in the place of Dalzell on furlough, to draw up the proposals for the reorganisation of the Forest Department.

At this period the Department consisted of the following establishment:

For the charge of the forests of the Deccan, Southern Mahratta Country, the Concan and Khandeish—one Conservator of Forests, Rs.500 per mensem; one Second Assistant Conservator, Rs.150; Office Establishment, Rs.192; Peons, Rs.38; Foresters, Rs.312; total, Rs.1182.

For the forests in Goozerat and the Dangs, exclusive of dépôt—one First Assistant Conservator, Rs.495; one Second Assistant Conservator, Rs.50; Office Establishment, Rs.105; Peons, Rs.10; Foresters, Rs.46; total, Rs.656, or a grand total of Rs.1838 per mensem.

Bingham's reorganisation proposals, dated 3rd June, 1862, were as follows:

"(1) The Conservator of Forests should, during his annual tour, visit as many of the forests as he is able, and communicate from time to time, or at the close of his tour, his suggestions to the Collectors with whom it would rest to carry them out, to control the sale of timber and to keep the accounts. The forest establishment of the districts should be subordinate to the Collector.

(2) The appointment of Superintendent of the Botanical Gardens should not necessarily be combined with that of Conservator of Forests; the Assistant Conservator of Poona and Sattara might also be "Assistant Superintendent of Botanical Gardens."

(3) Assistants to the Conservator should be appointed to the districts as under:

- i. Surat and country north of Nerbuddah.
- ii. Tanna Collectorate (north).
- iii. Sub-Collectorate of Colaba and Rutnagerie.
- iv. Khandeish, the Dang and Peith States, and the whole sub-Collectorate of Nassick.
- v. Remainder of Ahmednuggur, Poona, Sattara and Sholapoor.
- vi. Belgaum and Dharwar.
- vii. North Canara.

(4) The discontinuance of the depôts at Bombay and Calicut have been recommended by the committee ordered to assemble by Government under No. 11112, dated 13th March. The Assistant Conservator at Bulsar should dispose of the timber now in store in October or November next, and take charge of No. 4 district. Bulsar would be in No. 1 district, and any timber received there for sale from the Dang should be credited to the accounts of the Assistant Conservator, Khandesh.

(5) The Assistant Conservators should forward to the Conservator Annual Reports on the state of their charges, and should also transmit him information from time to time.

(6) All timber and firewood should be cut departmentally and the material disposed of, by periodical auctions or otherwise, as the Collector may think fit. In districts where this system cannot be carried out, a fixed sum should be paid on all forest produce, according to a published list of prices, subject to alteration by the Collector in consultation with the Conservator.

(7) In Surat and the country north of the Nerbuddah, and in most part of the Khandeish Collectorate, the forests have not been brought under the direct management of the Conservator, the Rules for their management and the forest establishment they require should hereafter be considered based on these Rules.

(8) At various places on the coast and near the forests, depôts should be established for the collection and periodical sale of timber. These depôts, with the exception of Sedasheghur and Bulsar, might be under the charge of the village authorities, an occasional visit being paid to them by a carkoon of the Forest Department to register the receipt of stock. Sedasheghur and Bulsar might be under a storekeeper on Rs.50 or Rs.60 a month.

(9) The value of timber given gratis for the repairs of temples, dharmasallas and works of public utility, or any extraordinary grant when sanctioned, should be credited and debited in the accounts.

(10) In Enam land, in which the holder has by his original sunnud (title deed) the right over teak and blackwood secured to him, trees of every description can be felled at his discretion.

(11) In Enam land, the holder of which does not possess such right, the sanction of Government should be obtained before he can claim the right over teak and blackwood.

(12) In land now under cultivation, and also in the Enam land mentioned in paragraph 11, the teak and blackwood trees might be offered to the holder at a fair valuation, and should they not accept it, the timber might be felled gradually, and disposed of by auction.

(13) Trees growing on Government land, under cultivation, are subject to 2nd, 10th and 11th Survey Rules, with the exception of teak and sissoo.

(14) All timber of every description passing through the country, except covered by a permit originally issued by the Forest Department, should be subject to detention for inquiry ; passes should be issued to all holders of Enam or other lands, on application to the mumlutdar of the district, at one rupee per 100, or one anna per 10. All passes should be given up to anyone appointed to receive them.

(15) Carts travelling in the neighbourhood of the forests by night should be liable to detention.

(16) When timber or firewood is not cut departmentally, or when application is made to gather timber which has been felled, dead wood, or to cut bamboos, a permit should be previously obtained (and paid for) from the mumlutdar of the district, or any authorised officer, and if the permit is for more than one cart or load, such carts or loads should be together when the permit is given up to the person appointed to receive it.

(17) No charcoal should be made within the forest reserves, or kilns erected, without the permission of the Conservator.

(18) The existing orders relating to dullee or Kumri cultivation, and the sale of waste lands containing trees should be scrupulously attended to.

(19) All receipts on account of timber and firewood, whether cut in forest reserves or unsurveyed waste lands, should be

credited to the Forest Department, and all expenses debited against it."

In a Resolution, dated October, 1862, the Government of Bombay passed the following orders on these proposals. The first point for consideration, the Government considered, in regard to the general question, and on which the future organisation of the forests materially depended, was the system under which the fellings were to be thereafter conducted. Captain Bingham had recommended a system of departmental cutting; to this the Revenue Commissioner, Northern Division (Mr. Ellis), appeared to agree, although he apprehended that in working out the plan difficulties would occur which were not contemplated. The details sketched out by Bingham's sixth proposal Ellis considered insufficient; but he suggested that if the adoption of the system was approved Bingham would be directed to prepare a matured plan, to be carried into effect after approval by the Revenue Commissioners, and to be reported for the final sanction of Government. In the meantime the Governor in Council directed "that the cuttings be conducted as far as possible on the system laid down in the Dharwar Rules, as amended in the Rules attached to Captain Bingham's Report."

The Governor then passed the following orders on the proposals:

"Proposal No. 1.—This proposal, his Excellency observes, is simply a repetition of the principles sanctioned by the Resolution of 2nd August, 1861, and is approved of. The Conservator should place himself in communication with the collectors for the speedy transfer of the accounts and forest establishments.

Proposal No. 2.—Hitherto the Conservator of Forests has held, in conjunction with that appointment, the appointment of Superintendent of Botanical Gardens, drawing for the duty a separate allowance of 250 rupees per mensem. This arrangement should be continued, the immediate management of the gardens of Dapoorie, Hewra and Parell, being vested in the assistant superintendent, whose appointment was sanctioned in 1847, and who should, subject to the control of the superintendent, keep separate the accounts of those gardens. The produce of the gardens will be managed with the view to promote the introduction of new, rare and valuable plants and trees; seeds, cuttings, etc., being distributed gratis under the rules lately sanctioned, and a

separate report should be annually rendered to Government by the superintendent.

Proposal No. 3.—This is approved of.

Proposal No. 4.—This is approved of.

Proposal No. 5.—The assistant conservators, although under the orders of the collector in all matters relating to the conservation of the forests and the realisation of the forest receipts, will nevertheless be subject to the Conservator as the head of their department, and will in that capacity submit reports direct to him.

Proposal No. 6.—This proposal is approved of; the system of cutting timber, departmentally, should, however, be introduced gradually only; until then the present fee system will remain in force, as directed in paragraph 34 of this Resolution.

Proposal No. 7.—This is approved of.

Proposal No. 8.—In this proposal allusion is made to the timber depôts at Bombay, Bulsar and Calicut, but the abolition of these depôts has been sanctioned by the Resolution, dated 28th October, 1862, on the Report of the committee appointed to consider the measures which should be adopted to insure the Government stocks of wood being turned economically to account, and the retention henceforth of small depôts at Sedasheghur and Bulsar only are contemplated. The formation of other depôts, as suggested in this proposal, will only become necessary for the sale of the timber as the departmental system of cutting is extended and should only be established where required. Whenever formed, they should be as near the forests from whence the timber is drawn as possible in order that Government may be saved taking upon itself the conveyance of the wood from the vicinity of where it is felled, as this is an undertaking which can best be managed by private enterprise.

Proposal No. 9.—Approved. Small grants of timber may be made by the collectors. For larger ones the sanction of the Revenue Commissioners should be obtained. The Revenue Commissioners will be requested to fix the amount within which the collectors may make grants.

Proposal No. 10.—Approved; but the Conservator should arrange for letting Inamdars have passes gratis to cover while in transit any wood cut in their own estates.

Proposal No. 11.—This relates to a subject under separate consideration, and respecting which separate orders will hereafter be conveyed.

Proposal No. 12.—The orders regarding the redemption of the land tax having been suspended by the despatch from the Secretary of State, dated 19th July, 1862, no such provision as that contemplated in this proposal is now called for.

Proposal No. 13.—As it is undesirable that Government should retain a right over teak trees now in Government lands not forming a part of the forest reserves, such trees may be offered, standing, to the occupant of the land at a fair valuation, and if they are not accepted by him on these terms, the trees may be gradually felled and disposed of by auction.

Proposals Nos. 14 and 15.—These are approved; care must be taken that no carts other than wood carts are detained for inquiry, and it can only be necessary in particular cases and places that wood carts travelling by night should be liable to detention.

Proposal No. 16.—This proposal is in accordance with the Dharwar Rules already sanctioned. Each load should be covered by a separate pass or ticket, so that there may be no needless detention of carts on account of the absence of another cart which may have broken down or otherwise been detained.

Proposal No. 17.—This rule is approved of, subject to such local modifications as may be found necessary.

Proposal No. 18.—The village authorities should be held responsible that the existing orders relating to dullee or Kumri cultivation are attended to.

Proposal No. 19.—The views of the Revenue Commissioner on this proposal are approved of, and should be acted upon by crediting to the Forest Department:

1stly. The whole of the receipts from the produce of the reserves in surveyed districts.

2ndly. The whole of the receipts from the wooded waste lands in surveyed districts, such as North Canara, such lands being considered forest until the reserves are settled and marked off.

3rdly. The receipts under Proposal No. 13 to be credited to the Forest Department; since teak and blackwood, wherever growing, except in Enam lands, have up to the present time been conserved by that department.

Reference has been above made to the havoc which has of late years been committed in the forests, owing to the inefficiency of the Conservator's establishment, for the purpose of watching and protecting the reserves. Captain Bingham has submitted with his letter a statement of the establishments which he

would recommend for each of the principal forest divisions, into which it is proposed to divide the Presidency. In accordance with the suggestions made in the Government Resolution of the 2nd August, 1861, it is intended to appoint an assistant to the Conservator to the charge of each of these divisions, the extent of each of which has already been explained in No. 3 of the Proposals. In the statement of the establishments submitted by Captain Bingham, a moderate personal establishment has been allowed to each assistant, and a body of foresters in accordance with the importance and extent of the forests in each charge has also been provided.

The sanction of the Government of India should be solicited for these establishments. In doing so, it should be explained that the Governor in Council considers the proposed establishments to be absolutely necessary, to prevent the total disappearance of all forest reserves within this Presidency, and to provide for the due protection not only of our supplies of timber, but of fuel also.

The salary of the Conservator is at present only 500 rupees per mensem, in addition to which he receives 250 rupees as Superintendent of the Botanical Gardens. This salary the Governor in Council considers too small for a well-qualified person, and for the performance of duties so important, and which extend over such a wide range of country as those of the Conservator. When the rate above mentioned was fixed, the department was organised on an experimental scale only, and Dr. Gibson was then comparatively young in the service ; but as he advanced in the service, it became necessary, in order to secure his great experience to the Forest Department, to grant him compensation for the loss of appointments to which his rank in the Medical Department entitled him, till at length he was in receipt of a salary of Rs.2138.13.4 per mensem.

On Dr. Gibson's retirement, the pay of his successor was put on its old footing ; but as that officer is an uncovenanted servant of Government, the prospect of receiving increased allowances, in the shape of compensation for loss of promotion in another branch of the service, is not open to him. Mr. Dalzell was transferred from the charge of the Sind forests to the larger and more important charge of the forests of the Presidency, but the change has benefited him pecuniarily to the extent of 50 rupees per mensem only (the pay of the forest ranger in Scinde is 700 rupees per mensem), and this merely in consequence of the additional charge of the Botanical

Gardens. If, however, the great cost of travelling in the forest districts of the Presidency, where luggage can only be conveyed up and down the ghauts and hills by ponies or coolies, be taken into consideration, it would probably be found that Mr. Dalzell was, as regards emoluments, in no way benefited by the change. His Excellency in Council considers that the salary of the Conservator should, under the new organisation of the department, be on the same scale as in Madras, viz. 1000 rupees per mensem; the charge for the Botanical Gardens being kept distinct.

With respect to the salaries of the assistants, these the Governor in Council considers should, on the first organisation of the establishments, be at the rates, and distributed in the manner proposed in the statement appended to Captain Bingham's Report, No. 621; but this will not prevent such transfer of the rates of pay from one charge to another, as may hereafter appear desirable. Care will be taken in making these appointments, as also in making all other appointments connected with the new arrangements, to provide as far as possible for the individuals already serving in the Forest Department, or at any of the abolished dépôts.

The abolition of these dépôts provided to the extent of Rs.1107.8, as shown in the statement above referred to, for the extra charge of the new arrangements; but it may also be noticed that the proposed charge for foresters will in part cover the amount annually expended in employing Muccadums to superintend the thinnings of the teak reserves, the wages of whom, together with those of the wood-cutters, are under the present system deducted from the proceeds of the cuttings, for these cuttings can hereafter, to a considerable extent, be supervised by the regular foresters. The amount which will be thus saved it is impossible at present to estimate.

In addition to the establishments shown in Captain Bingham's statement, it will be necessary to maintain as heretofore, during the fair season, the fee-collecting establishments. These should be charged for by monthly contingent bills, and the amount debited against the forest fees as they will be liable to change and fluctuations, according to the opening or closing of the reserves and other circumstances.

With the view of enabling the collectors to carry out speedily the orders on Proposal No. 1, the Governor in Council authorises them, pending the sanction of the Government of India, to entertain forthwith the establishment for the

Forest Account Department enumerated in Captain Bingham's statement. These appointments should be made in communication with the acting conservator, in order that the writers and carkoons at present employed in the Forest Department may be provided for on the abolition of the dépôts and alteration in the present establishments.

In 1860, the Government of India sanctioned the appointment of an accountant for the Forest Department on 200 rupees per mensem, but this appointment has been held in abeyance in consequence of a letter addressed by Mr. Dalzell to the auditor, Public Works Accounts, on the 6th October, 1860. Captain Bingham has, however, reported that, owing to the great increase of the account work, he has found it necessary to entertain an extra hand at 25 rupees per mensem, since the 13th June, 1862. The employment of this clerk is sanctioned, the expenditure being debited against the 200 rupees already authorised by the Government of India, and his services should be retained till all arrangements are completed."

The question of abolishing the Timber Agencies has been alluded to. These Agencies had become quite unnecessary. With a view to attain this end a Committee had been appointed by the Bombay Government to report on the supply of timber to public departments, and the question of the dispersal of the stocks at the existing Government Agencies at Calicut and Bombay, if these were to be abolished.

The Committee's Report is of very considerable interest. They divided the subject for consideration into two parts :

" 1st. The question of timber supply to public departments in all its bearings.

2nd. Rules to regulate the manner in which requisitions for timber shall be made and complied with, calculated to ensure Government stocks being turned economically to account.

The Forest Department of this Presidency exercises two distinct functions ; the one the conservation of the forests, including planting, thinning, felling and disposing the produce of the forests ; the other the supply of timber to public departments, including agency for purchasing stocks of such timber as the forests in its charge cannot supply.

For these duties establishments are entertained, the cost of which, for the year 1860-1, appears, from a return furnished by the Conservator, to have been 53,551 rupees, of which

15,435 rupees was for the payment of establishments wholly unconnected with forest conservancy, the remainder being for those partly employed on both.

During the same year, 1860-1, the cost of the Calicut agency was Rs.6784.3.6, whilst the value of timber supplied by it was Rs.5727.13.2, so that had the timber purchased been debited with the cost of the establishment employed exclusively for the transaction, its price ought to have been augmented 118 per cent.

The agencies for the purchase of timber both at Calicut and in Guzerat existed long before the creation of the office of Conservator of Forests; their primary duty used to be the supply of timber for shipbuilding in the Bombay Dockyard, and as shipbuilding on account of Government has now been abandoned, and is not likely to be resumed, the time has arrived when the necessity of maintaining these appointments should be reconsidered.

We have examined the master-builder of the dockyard as to whether any necessity still exists for the maintenance of the Calicut agency, and from his evidence we are satisfied that there is not; it is his opinion, and in which we concur, that even were shipbuilding on Government account resumed, the withdrawal of all interference on the part of Government with the timber market would tend to improve the supply and to reduce prices. We therefore conclude that the office of deputy conservator and agent at Calicut should be abolished. Captain Bingham has informed us that there is at various southern ports under the charge of the deputy conservator and agent at Calicut, timber which has already cost this Government 268,522 rupees, of which about 15,000 rupees' worth is rejected and inferior timber; and there are 107 poon spars, the cost of which has been 46,694 rupees.

To throw this large quantity of timber into the market now would be injurious to the interests of Government by depreciating the value of that in Bombay. We therefore recommend that all of it suited to naval purposes be offered to Her Majesty's Government at cost price, provided it be taken in the lump, with reference to the Despatch in the Revenue Department, No. 8, dated the 27th June, 1861. Should Her Majesty's Government decline the offer, sealed tenders might next year be invited, the timber in North Canara in the meanwhile being placed in charge of the assistant conservator of that district, and that in Malabar in charge of a few chowkeydars

and a carcoo, merely to watch it and be responsible for its safety. The inferior and rejected timber might, however, be sold as soon as the Conservator of Forests deems the time of year favourable for obtaining fair prices.

Since the year 1845 the officer in charge of the Guzerat timber agency has been entrusted also with the conservancy of the Dang forests. The question of maintaining this appointment is, moreover, mixed up with political considerations ; we have not therefore deemed it our duty to inquire fully into the merits of this branch of the department, and merely suggest, for the consideration of Government, whether as ship-building has ceased, and, as the supply of timber from Bulsar to the Bombay Depôt during the year 1861-2 was limited to 2128 rupees' worth, while the cost of the establishment was 9972 rupees, it be not desirable, on economical consideration, at once to modify this establishment, for effecting which, Captain Bingham informs us that a proposition is already under consideration. Payments to the Dang raja and fees on foreign timber amounted during the year in question to Rs.19,817.12.8, and the cost of cutting and clearing timber to Rs.69,278.12.4. The value of timber sold, and of fees realised during the year, was Rs.53,809.4.2.

The cost of the establishment for managing the Bombay Depôt during the year 1860-1 was Rs.8650.11.1, the value of the timber disposed of during the same period having been 176,680 rupees ; the land occupied by this timber is of considerable value, and is required for the cotton market.

We have given our careful consideration to the question of maintaining this dépôt. If it could be proved that Government derives any considerable revenue from it, or if timber through its agency were supplied to public departments either cheaper or better than through the market, there might be reasons for its continuance, but so far as we can ascertain neither of these reasons exist. The Conservator's prices, fixed arbitrarily by the Conservator himself some years ago in communication with the late Military Board, are in excess of the market rates ; in one instance as much as 14 per cent, and although, from a statement with which Captain Bingham has favoured us, it appears that the actual cost of timber supplied to the dépôt by his assistant costs Government less than the market price, yet the facts that it has to be sold off at a great sacrifice, that there is a large stock of timber in hand which has been rejected and cannot be economically

used, and some which, we are of opinion, ought never to have been purchased on Government account, lead us to the conclusion that, on the whole, it is very probable that Government is rather a loser than a gainer by importing timber on its own account.

We are further of opinion that it is impolitic on the part of Government, unless it be absolutely necessary to do so, to compete in the supply of timber with traders ; and even with respect to the produce of its own forests we believe that, excepting a few choice logs, sometimes not procurable in the market, it would be better to sell by public auction all Government forest timber at times and places convenient for traders to assemble, rather than to convey it to distant points, either for sale or for Government use.

There will, of course, be exceptions to the above rule, such, for instance, as in places where the demand for timber being almost exclusively on account of Government, no open market exists, and where supplies being required by public officers residing near the forests, or near the spots where periodical sales are held, purchases should be made at the Government sales and not in the market.

If Government derived a large revenue from the Bombay Depôt, even though part of that profit were at the expense of other departments, there might be reasons for its continuance ; but as we cannot satisfy ourselves that even this is the case, and, for the reasons above given, we have come to the unanimous conclusion that the Bombay timber depôt should be abolished as soon as the present stock can be disposed of."

It is of interest to draw a parallel between the position in respect of timber supplies held by the Bombay Government sixty years ago and the cost of establishment and deterioration thereby entailed, and the similar position of the British Government, although on a much larger scale, at the close of the Great War. The Committee's Report continues :

"Having arrived at the conclusion that Government ought to leave the supply of timber to merchants, and that agencies for its purchase and depôts to store it in should be abolished, the second question we have to consider is limited to the stocks now on hand.

Within the dockyard there is a considerable space for storing timber, and we deem it desirable that the Naval Department should receive from the Conservator of Forests and

store within its own premises a supply of timber equal to about three years' probable consumption.

The agent for gun-carriages, the principal commissary of ordnance, the garrison engineer and civil architect, the executive engineer at Aden and the executive engineer at Kurrachee, should also take three years' supply, or as much (within that amount) as the stocks in Bombay and Bulsar will supply.

There is doubtless in 'stock' a very large quantity of timber of some classes more than sufficient to meet the three years' supply of the several departments named, and there is timber which, though of classes required, would, under existing rules, be rejected, because it would not work up without an undue amount of wastage. Officers should be required to take timber fit for the uses of their departments, provided it could be worked up without any greater loss than 40 per cent.

The timber that may remain should then be disposed of by public auction; one-third should be sold at once, one-third on or about the 15th of October next, and the remainder in the month of February, 1863, with the exception of the crooks which might be offered to Her Majesty's Government on the same terms as the timber in Canara and Malabar.

The price charged to public departments should be the same as that realised by Government for serviceable timber of the several classes at the first public sale; but in order to prevent any inconvenience arising from Budget arrangements, one-third, or such portion in excess of that quantity as may be actually expended during the year, should be paid for during the first year, and the remainder during the two subsequent years.

We recommend that the Indian Navy Department first select its three years' supply, in which should be included all the timber now within its premises, but still in charge of the Conservator of Forests; the agent for gun-carriages should next make his selection; then officers of the Public Works Department, and last the principal commissary of ordnance."

In a Resolution on the above Report the Governor said that he was of opinion that the functions of the Conservator and his Department should be strictly confined to the conservation of the forests, including sylvicultural operations and disposing of the produce of the forests, and that the supply of timber to public departments and the care of the reserved stocks was a duty which should not have been assigned to the Conservator's Department. In the reorganisation of the Depart-

ment the Governor desired that its duties should be confined to its own proper functions, and where it was necessary to maintain stocks of timber, such as in the dockyard, gun-carriage, etc., each department should store and conserve its own supplies. The Committee had clearly shown in their Report that the depôts had been most expensive agencies ; the cost of establishment in some cases more than doubling the price of the timber purchased through them.

The Governor-General in Council approved generally of the several suggestions made by the Committee and sanctioned the abolition of the Agencies, "the officers employed in them being provided for in the reorganisation of the Forest Department." The Governor considered, however, that "with respect to the disposal of the reserve stocks at Calicut the public departments should, if they cannot obtain sufficient timber from the Bombay and Bulsar Depôts to make up their three years' supplies, be permitted to indent on the Calicut Agency to complete these supplies. The Agent should then set aside all the timber and crooks fitted for naval purposes to be offered to the Admiralty as suggested by the Committee."

The Governor did not approve, and correctly so, as the evidence of the past management of the timber business had so often shown, of the suggestion that the public departments should go into the open market and compete against one another to the benefit of the traders. The measures to be adopted would depend on the decision come to on the future forest management. "Should the departmental system of cutting the forests be adopted," said the Governor, "there will be no actual loss to Government if public departments compete against one another at the periodical Government sales of timber which must take place under that system, because such competition would have its effect in preventing private parties from combining to lower prices, and what Government loses by paying highly for timber in every other department will be repaid by the additional receipts in the Forest Department. Should it, however, be found impracticable to carry out the departmental system of cutting, and the forest management be conducted on a system of licences granted for the cutting of timber, or on the present fee system, under which private individuals become the owners of the timber they fell, his Excellency in Council considers it will be found desirable to appoint a single purchasing agency for all the public departments. In the meantime public departments

should only obtain from the market what they cannot get from the stocks in the several dépôts.

In the event of its being decided that each Government department is to provide itself with whatever timber it requires at the periodical sales, his Excellency in Council considers that arrangements should nevertheless be made, whereby the departments could at any time on an emergency be supplied with timber, without waiting for the auctions.

A dépôt for this purpose should be formed at Sedasheghur, or other convenient place in the vicinity, under an officer who should select suitable timber brought down from the Canara forests. From this dépôt, which should be placed in charge of an officer who will be appointed to Sedasheghur, and who will receive an allowance of 300 rupees per mensem for the separate duty, the public departments might, when necessary, be supplied with timber at 5 per cent over the last auction rates.

Public departments and private individuals should also be allowed, in cases of emergency, to draw on the dépôts, at which timber will be collected for sale at such advance, not less than 5 per cent on the last auction rates as the Conservator of Forests may consider advisable."

Before noticing the Secretary of State's Despatch on the Bombay Government's Forest Department reorganisation schemes it will be necessary to deal briefly with the correspondence which took place at this time on the subject of the Khandeish Collectorate Forests. The correspondence affords ample evidence of how little attention had been paid to the forests by the Collectors and also that their superiors remained in ignorance of the utter neglect of all conservancy even to the point of refraining to collect revenue which was undoubtedly leviable on the timber felled in Government forests.

Mr. Ashburner, Collector of Khandeish, in a letter to the Revenue Commissioner of April, 1862, wrote as follows :

"The contractors who have engaged to supply the railway with sleepers have hitherto been allowed to cut down Government timber in the Khandeish zillah gratis; they have entirely exhausted the teak in the Satpuras, and are now rapidly using up inferior timber. I have the honour to request your sanction to levy from the contractors two annas per sleeper; the proceeds will be very large, and as I propose to collect it in the large railway stations where the sleepers are delivered, the cost of collection will be very trifling, and

there will be none of that vexatious interference with traffic that invariably attends the collection of fees at nakas (toll stations) on the high roads. This way of collecting the tax will also avoid interference with the Bheels, who earn a precarious livelihood by cutting timber in the Satpuras and selling it to the contractors.

The contractor who cuts timber in the disputed Nowapoore jungle pays Government four annas per log, and I am aware of no reason why other contractors should enjoy the right of cutting Government timber on more favourable terms. The railway company pays the contractors four rupees per sleeper of teak, and Rs.3.12 for jungle wood, delivered at the railway; and as the sleeper can be delivered for about half that sum, the contractors can afford to pay the small sum of two annas for the timber.

As the timber carts form the chief traffic on the roads, I request that I may be allowed to expend the proceeds of the tax on the repair of roads."

In his reply the Revenue Commissioner pointed out that proposals for a general revision of forest arrangements had just been submitted to Government, and that the substitution of a system of departmental cutting in lieu of the fee system had been recommended. He continued : " If the taxation of the wood to which your letter refers could be carried out by employing Bheels to cut it and then selling it by auction, the scheme would be more in accordance with that which has been proposed for general adoption, and I should be glad if you will communicate direct with the Conservator to arrange the details of such a plan.

There is certainly no good reason that I am aware of for exempting from taxation the wood taken by contractors from Government forests, and I am surprised to learn that they have hitherto been allowed to cut teak in Khandeish without restriction. I presume that in proposing a fee of two annas per sleeper you did not intend to restrict the import to railway contractors, for this would be equivalent to a tax on the railway. Logs cut for other purposes should also be taxed, but if the mode of taxation suggested by you be adopted, the objections which have been generally urged to the fee system elsewhere would, it seems, be applicable to this levy.

It is clear that some check should be put on the destruction of teak in the Government forests, and therefore one system or the other should be brought into force after the monsoon,

and timely notice should be given before engagements for next season are entered into.

The proceeds of the forests are a portion of the land revenues, and the authority applied for in your concluding paragraph could not be given. Nor is such an appropriation necessary, as, with proper attention to existing rules, the collector has now no difficulty in obtaining whatever reasonable amount of money may be required for public works."

The Collector's letter was submitted to the Conservator. In reply the latter approved of the suggestion to collect the fees at the large railway stations, but thought it would be better to employ the Bheels to cut and collect the timber at a certain sum per candy and sell it by auction, for he said : " Mr. Ashburner will find it very difficult to collect fees without a good many attempts at fraud between the carcoons and merchants." The Conservator said that the Khandeish Collectorate Forests, with the exception of these in the Baglan taluk, had never been under the Forest Department ; " in fact, the reserves have been put bit by bit under the Conservator's charge. The establishment of foresters is utterly inadequate to look after them." The fees taken on wood in the Nowapoore jungles were credited to the Forest Department in the accounts of the Assistant Conservator in Goozerat.

In a second letter (June, 1862), Ashburner enquired of the Revenue Commissioner as to the amount of the tax to be levied for timber already cut by railway contractors in the Pall Tappa and other parts of the Satpuras. He said : " As soon as I found, on my late visit to the Satpuras, the extent of the mischief that had been done, I prohibited all cutting of Government timber till further orders, and reported to you, but large quantities of railway sleepers had already been cut and were awaiting carriage. To prevent loss to the contractors, I have allowed them to remove the timber already cut, on their giving an agreement, in writing, to pay whatever was subsequently demanded from them. I now beg to suggest that they should be required to pay 4 annas per log, or 2 annas per sleeper, which is what is paid for the right of cutting timber in the Nowapoore Jungle. I only proposed to levy the tax on railway sleepers, because the railway is the only consumer of this description of timber.

The difficulty of levying the tax, except at railway stations, is so great in an open country like Khandeish, that I trust

Government will, on reconsideration, not object to this mode of collection.

From Rawere on the east to Kookurmonda there are probably as many as a hundred roads by which the timber is brought from the hills, and as it is delivered at all parts of the line, the number of nakas necessary to command all the roads would be very great and the expense would be in proportion. I am not aware of the objections which have led Government to prohibit the system of collection by nakas at the railway stations, but I would suggest that the difficulties of any other system are, in open country like Khandeish, almost insuperable."

Ashburner addressed a third reference (August, 1862) to the Commissioner on the necessity of exercising some supervision and control over the transactions and dealings of the Mehwassi chiefs with speculators who supplied railway contractors with timber. The Collector wrote : " You are aware of the ignorance and improvidence of these chiefs ; for a few bottles of bad brandy and a cheap rifle, they are always willing to part with the timber of their territories, and as ready to repudiate the transaction in favour of anyone who makes a more liberal or tempting offer. The evil would be less felt if the chiefs would confine their transactions to a transfer of their own rights ; but they sell the right of cutting timber, and at the same time prohibit their subjects from cutting it. The supply of the wooden axle-trees of carts and firewood affords a means of livelihood to a large proportion of the Khandeish Mehwassi Bheels : if they are deprived of this, robbery is their only other means of support, and they are only too ready to adopt it. I would beg to suggest that Government take a perpetual lease of the whole of the forests south of the Nerbudda River. This would enable us not only to preserve much valuable timber, but would remove the danger and demoralising effect of these transactions of unscrupulous speculators with the ignorant and turbulent inhabitants of the Satpuras."

This letter was referred to Bingham, who endorsed the Collector's proposition and recommended that a similar system should be pursued with other native territories wherever practicable, as it would not only " preserve their timber, but it would also prevent the robbing of the Government forests, from which a large quantity of timber is annually passed through the country under the name of ' Timber from

Foreign States.' The forests of the Dhang have been rented from the Rajas for many years past, and the Collector of Khandeish has just renewed the lease ; those in Soustan Peit are now under the Forest Department, and if the lease of the forests of Durumpoor and Jowar could be obtained, I would certainly recommend it to be taken."

The Commissioner, in forwarding these remarks to the Bombay Government, said :

"I concur with the Collector and Conservator of Forests in their opinion that it is desirable to take a lease of the jungles from these Mehwassi chiefs on terms similar to those already taken in the Dangs.

The substance of the Dang leases is as follows : at first the leases were agreed to for a definite term of years, but on the expiration of the fixed term they were renewed indefinitely. It would not be correct to call these leases 'perpetual,' for they are renewed only for so long as Government may desire to continue the agreement, a very different thing from an agreement which is permanently binding on both parties.

In return for the payment of a fixed annual sum in two instalments the Government have the exclusive right of dealing with all timber within the estate of the chief giving the lease, the sole exception being rafters and the like, which the chief may require for his own house, and which he retains the privilege of taking.

In the event of the jungle being cleared for cultivation, Government are to pay rent to the chief, besides the sum stipulated for in the lease ; but Government have the right of cancelling the lease at any time on six months' notice. There are besides provisions permitting the cutting of roads, if Government desire to do so, and for binding the chiefs not to alienate in any way their lands to other States or persons without the sanction of the British Government.

The same form of lease may be adopted for leases with these Mehwassi chiefs, if Government see fit to sanction the proposal. There is one clause, however, which I think is open to some objection. It is quite proper to give the chiefs rent on account of any cultivation that there may be on lands cleared of jungle ; but unless at the same time a corresponding deduction be made in the amount of the lease, there will be much difficulty in getting rid of the lease even when all the timber is used up. It would not be fair to the chief to clear the jungle rapidly, and then throw up the lease ; but if by the

progress of cultivation and demand for grain crops the jungle limits are encroached upon, and the chief desires to receive rent for lands thus brought under cultivation, it will be necessary, when paying him rent for the cultivated ground, to make a deduction from the amount of lease, otherwise Government will find itself bound to pay for a supposed jungle, while the chief receives the rent of the land which no longer produces wood ; of course, in such a case, Government might, if it pleased, throw up the lease, but the chances are that it would be reluctant to do so from kind consideration of the chief.

Though I consider that leases from the petty chiefs would be desirable, I doubt very much if it would be expedient to ask Holkar to enter into such engagements ; as for the Jowar and Dhurumpoor rajahs, I am quite sure that the former would not consent except on terms which could not possibly be entertained, and both these chiefs, as well as Holkar, are quite able to take care of their own interests without the interference of Government.

If the proposition be sanctioned, the duty of negotiating the leases with the chiefs had better be entrusted to the Assistant Conservator of forests in charge of the Dangs, in communication with the Collector ; but some care will be required to ensure the chiefs receiving a fair sum on the one hand, and to protect Government on the other from being imposed on."

In a Despatch, dated 30th March, 1863, the Secretary of State in reviewing the proposals for the future management of the Bombay Forests "entirely approved" of the measures taken by the Government of that Presidency. The Despatch shows how clearly the India Office Authorities had come to realise the position in India and how set they were upon the introduction of systematic forest conservancy in the country. The Secretary of State wrote :

"The rules proposed for the future management of this important branch of administration under your Presidency, seem well calculated to promote the very desirable object of settling the administration of the Forests on a sound and permanent system, so that it may not be dependent upon the qualifications of any single officer ; and to this end an increase of establishment, such as you have proposed, and the relieving the Conservator from all duties, except those which are strictly connected with the conservation of the Forests,

would seem to be essential. It would also seem very right to fix a salary suitable to the important post of Conservator of Forests. This had not been done in former times, owing to the peculiar position of Dr. Gibson, who held the office for many years. But the salary was clearly insufficient when the extra allowances enjoyed by that officer were deducted. From the Government of India, to whom you have, I observe, applied for sanction to your proposed arrangements, you will no doubt receive early instruction for your guidance.

It is also absolutely necessary to the preservation of the Forests that the Conservator should be supported by a staff of competent assistants, and that the salaries of the executive subordinate persons employed should be such as to secure efficient service from them by removing the temptation to be dishonest. It was, as Mr. Ellis has remarked, not to be expected, when these persons were merely carkoons, paid a meagre salary for only eight months in the year, and entrusted with highly responsible duties, that any supervision could make the management of the Forests successful. Mr. Hart's remark that the object of the Forest Department is not so much present income as prospective security from being left without timber, is very just; but it is very satisfactory to find that, in his opinion, by a proper management of the sale of firewood alone, almost all, if not all, the proposed expenditure may be recovered by Government.

Although the present Department will have an independent action, you have properly directed that the assistants should report to the Conservator; they will, nevertheless, be under the orders of the collector; and you will enjoin upon all collectors the necessity of an harmonious co-operation with the Conservator and his officers, and impress upon them that the proper growth and preservation of the Forests is as important to Government as the cultivation of any other crop which the soil produces, and in some instances more important, since the destruction of the Forests would affect most injuriously the climate, and perhaps the fertility of the soil of the rest of the districts. For this reason I trust that your Excellency in Council will see that the caution not to dispose of forest lands as waste, conveyed to you by his Excellency the Governor-General on the 26th of September last, is very strictly attended to.

I quite concur with Captain Bingham's views of the advantage of bringing all forest lands, as much as possible, under the

management of the Conservator's Department, and also of introducing the practice of departmental cutting; and I approve of the attempt to obtain leases of the forests of the Mehwassi chiefs of Khandeish. The more powerful rajahs are, in the opinion of the Commissioner and of your Excellency in Council, able to protect their own interests; but, should they show any inclination to give leases of their forests to Government, you will not fail to avail yourselves of it, always supposing that the terms proposed are not exorbitant. It is no slight recommendation of the arrangement with the Mehwassi chiefs, that it will not only stop the present destruction of valuable timber by the Bheels, but will tend to the civilisation of these tribes, by supplying them with regular employment and the means of subsistence as cutters of teak on behalf of the Forest Department.

With reference to your remarks on proposal 9, I would observe that the collector should make periodical returns of all the grants of timber, small as well as great, which he may give under the rules.

Your instruction, that the village authorities are to be held responsible for the observance of the orders as to Dullee and Kumri, will, I hope, secure the forests from the effects of that destructive system.

Your proposal as to the isolated trees standing on Government land, and not forming part of the forest reserves, seems to be judicious.

The increasing demand, both for timber and fuel throughout India, has caused the Governor-General of India in Council to turn his attention very earnestly to the subject of the conservation of the forests, and I transmit to you, for your information, a Despatch which I have recently addressed to his Excellency on this important subject."

This Despatch is given in the last chapter of this volume.

"The transfer of the accounts from the Conservator to the collector is a very proper change, and will relieve the former officer of a charge foreign to his legitimate duties."

The leases of forest from the Mehwassi Bheel chiefs were not obtainable. Ashburner had several interviews with the chiefs, but was unable to come to any arrangement with them, the reason being that those who still had accessible uncut forests had already leased them to contractors supplying the railway with sleepers. The amounts of timber some of these chiefs had bound themselves to supply were in some instances,

said the Collector, "more than the whole of their estates could produce in the next 50 years. They have not the remotest intention of fulfilling these contracts, and if subjected to any legal pressure, would probably go into rebellion. The chief Chikly assigned the whole of the timber of his estate to one contractor and a few months after passed a similar deed of consignment of the timber to another contractor. These bonds are at present so much waste paper in the hands of the contractors ; but were Government to take a lease of the forests they would become valuable, for Government would be liable for all engagements entered into by the chiefs."

The Collector said that in another year the railway would have advanced so far that these forests would hardly be available for railway timber, and the timber would by that time be nearly exhausted ; the exorbitant demands of the Chiefs would then moderate and the contractors might, for a small consideration, be induced to part with the bonds they had received from the chiefs. A suggestion which Government endorsed.

Ashburner concluded his letter : " In the meantime I do not think anything can be done, except to put an end to the plunder of the Bheels by the low Mukranies and other adventurers who infest that part of the hills. On my late visit to Tulloda I found they were in the habit of frequenting the roads by which the Bheels bring in the timber, and extorting it from them at less than half its value. I have taken measures to protect them from this system of plunder, but they are such a simple, timid race, that it is almost impossible to protect them from the fraud of the more civilised classes." An experience which many a Forest Officer since Ashburner's time has exercised his wits and ingenuity to circumvent in the interests of the jungle men.

In 1863 Ashburner expressed the opinion that Forest Reserves could be advantageously made in Khandeish, but he deprecated the application of the general forest Rules to the Collectorate. On this the Secretary of State commented as follows : " I would remind you of the opinion expressed by me as to the advantage of bringing all forest lands as much as possible under the Forest Department."

The question of encouraging immigration into the Panch Mahals, which were ceded by Scindia in exchange in December, 1860, and of protecting the forests from the wasteful destruction to which they were being subjected came up at this

period. Major Buckle, Political Agent in the Rewa Kanta, had submitted proposals on these matters. The forests possessed abundance of teak and other timbers valuable for sleepers, of which Dalzell in a Report of 1863 (after his return from furlough) enumerated *Butea frondosa*, *Ægle marmelos*, *Bassia latifolia*, *Diospyros*, *Pterocarpus marsupium*, *Nauclea parviflora*, *Acacia Catechu* and others. On the subject of the forests Buckle wrote in January, 1862 :

" Before the demand for Railway sleepers, these tracts of forest yielded a very small return to the late Government. There was no attempt at conservancy ; timber as property, with the exception of teak, was held to be of no account both in this and the adjoining native states, and realised only an average of 14 annas export duty per cartload. There has been no restriction as to cutting by any inhabitant or speculator whatever. A railway contractor has now been engaged for some time in felling timber for sleepers from these jungles for delivery at Aunund and Baroda, and must have realised a considerable sum. My information is not complete, but from personal inspection and inquiry I expect to find that at a contract price of Rs.2.10 per sleeper the contractor can afford to pay all expenses, and deliver each sleeper at either of the above-mentioned places at a net profit of 14 annas per piece. The Government interest at present in the trade is something less than two annas per piece in the northern districts, and for sleepers produced at Tullowree in the Naikra country, five pice only. It is obvious that valuable property belonging to Government, under these circumstances is being diverted to private hands to large amounts, and I have therefore guaranteed to the contractor his stock in hand only, and have reserved the subject for revision on the completion of my inquiries. The accumulating stock of the contractor after the issue of my order on the subject is to be separate and under the supervision of the Customs Department. I anticipate that not two, but seven to eight annas can be realised on each sleeper either by public auction, or, probably still better, by a stipulation for a half-share in the profits free of expense. I foresee and disregard the interested objections which will be made. It will be said that the British Government is raising its export duty, which will be true so far as that is the readiest means of realising the value of the Government property in timber, but the cost to the railway company will not be increased, as it is out of the question to suppose that a

contractor could not be found to supply sleepers at a net profit of from seven to eight annas per piece. An ingenious remark was made to me last rains by the contractor (a Parsee) in deprecating any increase upon the timber tariff. He said, 'Why, I shall be clearing your jungles for you.' Nothing could be more fallacious, for while he carries away the best wood, he leaves all the scrub and the jungle as thick as before.

In order to secure the sale of the Government wood at a fair price it will be necessary to protect it by raising the duty upon Barreah and Oodeypoor sleeper timber in transit. Both these states produce the article in large quantities; they are further removed from the railway than the Panch Mahal forests, and have no outlet except through our districts. Tributary states have not the power of raising the tariffs, or they would no doubt have done so on the occurrence of the present demand. Up to this time timber fit for sleepers has been of no value in the native states in which it is produced until it is exported, and the petty states above-mentioned have realised no more than 14 annas per cart-load on export. But it will be for Government to determine upon the participation in profits from this source by the chiefs concerned on the raising of our tariff. The only object of revising our tariff is to prevent the destruction of our own forests, not for the interests of the railway company, but in those of the private speculator; for I am thoroughly convinced that I shall be able immediately to conclude an arrangement by which the Government will secure a half-share in the profits arising from the cutting of sleepers at the current contract rate, viz. Rs.2.10 on delivery.

I do not propose in this Report to revise the present rates upon the export of teak either from our own or from native territory; they are more remunerative, and I think should be reserved for further consideration and report by the Conservancy Department.

And with regard to the latter section of this Report, I would suggest that an experienced officer of the Forest Department should be deputed to report upon the subject, and especially to inform Government of the advantages, or otherwise, of introducing an establishment for the conservancy of teak. This wood is not felled for sleepers, probably because the size is inadequate, or, if that be not the case, because good pieces are too valuable for that trade. Teak in any form is at present exported at very much higher prices than those which obtain

in the export of timber for sleepers, the one being called hard and the other soft wood, though the latter term is a misnomer."

In reply to this letter the Government said that the utmost care should be taken to preserve the Forests of the Panch Mahals and that the Conservator had been ordered to visit and report on them.

In a subsequent letter Buckle said that fearing trouble might arise with the Bheels and other jungle tribes he found it inexpedient to introduce measures of forest conservancy until the Conservator had reported on the value of the forests. The measures he had introduced to obtain an adequate revenue for the sleepers cut by contractors were working well. He had forbidden the export of sleepers at the 2 anna rate, and had given a monopoly of export of sleepers to two native firms of timber merchants for 4½ months at a profit of 8 annas a sleeper to Government. He estimated that if Government sanctioned this step the receipts from timber would reach Rs.20,000 for the year ending 5th June, 1863.

Dalzell visited and reported (6th April, 1863) on the forests. He stated that the whole country north of the river, which runs east and west past Godra up to the boundaries of the district was an open jungle, full of a great variety of trees, many of them of very valuable kinds. Teak was to be found everywhere, in many places to the exclusion of everything else; but there was no teak timber of any size left in the forests. For a long period the trees had never been allowed to grow of any size. They were shoots from stools, which as soon as they had reached the thickness of two to three inches in diameter were cut out and sold. The result of this constant hacking was that the forests were full at that time "of millions of cankered stumps." In one place he found a grove, regarded as sacred, of very fine teak trees. In the Mehlore district also, which was the property of a Thakoor, the teak was everywhere preserved and promised in a few years to be a valuable source of revenue. With this example before them and as a help in dealing with the natives Dalzell suggested that a Rule should be introduced prohibiting the felling of any teak for trade (export) of less circumference than 4 feet. The Rule would still permit of the inhabitants cutting in the jungle woods for their own houses and for agricultural purposes. "To show," he said, "the extent of the trade in timber (chiefly teak logs and rafters) I saw at Ruma, which is one of the gates of the country leading to Ahmedabad, fully half a square mile

of carts laden with timber, most of which was from Barryah (a foreign State), and where a speculator had established himself to take advantage of the abundant supply and absence of competition."

Dalzell suggested the introduction of conservancy, and that the natives, Bheels, Koolies and Naikras should be employed under the Foresters in making thinnings in the young growth in the forest, this being the kind of work they liked.

The Conservator's suggestions were adopted by the Bombay Government, who considered that his proposal to employ the jungle tribes on thinning work in the young forests would lessen or remove the possibility of a rising amongst these latter when the new conservancy methods were introduced into the forests.

It will be remembered that in Madras Blane had alluded (p. 222) to the fact that one of the arguments advanced in favour of permitting the continuance of Kumri cultivation was that the clearance of the forest decreased the prevalence of malaria. A considerable correspondence took place at this period on the subject. A result of the prohibition of Kumri cultivation in Mysore was a large influx of people practising this method into Canara, the practice having been taken up by ryots and others of quite different classes from the jungle tribes, who, preferring to live a roaming life, had lived in this fashion for centuries. The increase of population practising this form of cultivation severely threatened the total ruin of the Canara Forests. In June, 1864, Mr. J. Shaw Stewart, the Collector, gave the following table, showing the clearance of forest by Kumri between the years 1854-5 and 1864-5. The area of forest land in the Collectorate was stated to be not less than 2000 square miles.

1854-5			
1855-6			
1856-7			
1857-8	7501	acres.	
1858-9	8751	"	
1859-60	7357	"	
1860-1	6474	"	
1861-2	1235	"	(Kumri suppressed).
1862-3	154	"	
1863-4	7144	"	(Kumri again permitted by the Revenue Commissioner). [this year].
1864-5	4270	"	(The Collector authorised this extent for

The Collector stated that for the latter year the prevalence of fever in the Collectorate was in no way attributable to the prevention of Kumri cultivation. He mentioned that in 1856-7 before Kumri was suppressed a scourge of malaria carried off 2933 people.

Although much yet remained to be done and the opposition by some of the Revenue Officers to the introduction of conservancy into the forests had by no means been removed, yet the end of the period found a distinct progress achieved in the administration of the forests of the Presidency. This is exhibited by the following extracts from a letter (August, 1864) from the Secretary of State to the Governor in Council, Bombay. After alluding with satisfaction to the measures which had been adopted for putting in operation, in the Tanna Collectorate, the departmental system of cutting timber and fuel, and to secure the conservancy of Government Revenue and "defeat the monopoly of the dealers in wood, whilst the privileges hitherto enjoyed by the agricultural classes, in respect to supplies of timber and fuel for domestic and agricultural purposes, are continued to them," the Despatch proceeded :

" Such grounds of complaint as the Revenue Commissioners pointed out to be well founded were at once corrected, but it was clear that the greater part of the petitions sent in against the new system originated in the intrigues of the dealers in wood, who were anxious to preserve their monopoly, and who by combination defeated the success of the first auction sales established by the collector at the railway depôts. I am glad to observe that there are evident symptoms that this monopoly has been broken through without recourse to the expedient of giving up all the firewood on certain conditions to a company, which I agree with Mr. Ellis in considering would have been very objectionable, as merely transferring to the company a similar monopoly to that exercised by the old dealers.

The method you have adopted of bringing the wood ready prepared for sale, to depôts where it will be sold by auction will, I trust, effectually throw open the trade and lower the price, thus relieving the present scarceness of this important article, while a due supply for the wants of future generations is preserved. The arrangements which you have made for the retail sale of firewood in small quantities at fixed rates will, it is to be hoped, extend the benefit to the lower classes.

I have read with interest the proceedings of the committee appointed to consider the forest question, together with the remarks of the Commissioner, and the Resolution of your Government.

I agree with you that it is highly important that a demarcation of the Government forest reserves should take place at once. I also approve of your having adopted the views of the committee in establishing specially reserved tracts of forest land, to which, under certain restrictions, the ryots of villages situated near these jungles may have access, in order to provide themselves with fuel and timber for domestic and agricultural purposes. Such an arrangement is far more in conformity with the object of forest conservation than the one proposed by Mr. Ellis, of handing over to the ryots large tracts, which would be denuded in a very short time, when the same difficulty would again arise. The settlement of the privileges of the agricultural classes living at a distance from the jungles seems also very proper, and the precautions which you have ordered should be taken, will, I trust, prevent the abuse of these privileges. It is well that you have directed the superintendents of survey to make inquiries into the claims of villages in other districts to similar privileges.

The plan of setting aside a proportion of the increased forest revenues for making roads to and through the more distant and hitherto inaccessible forests, seems to me, by affording the means of transport to distant markets, to be well adapted for keeping up the supply of timber and firewood without exhausting the forests which are close at hand. Some expressions in your Resolution would seem to indicate that the sum thus set apart is to be mixed with other local funds, but I am of opinion that these funds should be kept distinct and that the Forest Department, under the control of the Revenue officers, should entirely deal with the collection of these funds and decide upon and conduct their employment on the object for which they are raised.

As you concurred in opinion with all the officers consulted, that legislation was necessary, the draft Act which you approved, with some modifications, should be passed as soon as possible, in order to give the necessary powers to the officers to act. There are, however, some clauses which will require great discretion in the officers to whom is entrusted the execution of the provisions of the proposed Act. I refer to Clauses 21 to 23, regulating the cutting of timber by inamdaras and

private proprietors. I would suggest to your Excellency in Council whether it would not be a sufficient protection to the Government forests, if the authority of the forest officers were required only for the removal from off the property of the inamdars of the timber cut, leaving an inamdar at full liberty to cut without permission on his property what trees he may require for the use of his own estate.

It is very satisfactory to learn that the class of persons called katkurries, who could no longer, consistently with conservation of the forests, be permitted to cut timber as they pleased in the forests, have found employment in their old trade from the contractors and from Government."

In August, 1865, the Secretary of State had occasion to complain that the Annual Reports of the Forest Department had not been sent to him in past years. He had just received the Report of 1862-3, but had not seen any of the intermediary Reports since 1859-60. The 1862-3 Report merely treated of the financial results of the forests for this period.

The Receipts were	Rs. 5,84,729
And Expenditure	98,289

To the balance of	4,86,440
The Conservator claimed to add a further sum of about	90,000

Obtained by timber sold at auctions, but not brought into the year's account, making the gain of the year	Rs. 5,76,440
---	--------------

The Secretary of State added the following remarks on this Report and other forest matters :

"The Conservator states that the net gain of the year under review, compared with the year 1861-2, if the statement for North Canara, which in that year was not under your Government, be excluded is 8803 rupees. Of the accuracy of this calculation I have not the means of judging from the statements before me, but such a result must be considered favourable, since it is said to have been obtained without unduly trenching on the resources of future years, care having been also taken to prevent waste.

The new system, moreover, by which all the produce of the forest will be put up to open competition, as well as the

teak, will secure the full market value for it, and is expected to increase considerably the forest revenues.

You have caused inquiries to be made on the two points, specially injurious to the forests, brought to your notice by the Conservator : the great sacrifice of land covered with valuable timber made over to cultivation in the Belgaum collectorate, and the inadequacy of the amount imposed as fines for illegal cuttings in the forests ; I shall therefore make no comment on them until the reply to those inquiries is before me.

I have read with much interest the able report by Mr. Wedderburn on the complaints of the cultivators of the *Areca* gardens in the Sircy talook of North Canara. Mr. Wedderburn clearly showed that, on the one hand, considerable hardship was inflicted on the cultivators, by enforcing the forest rules in regard to the restrictions placed on the cutting of foliage for manure, and also of firewood for agricultural and domestic purposes, from forest land adjoining their garden cultivation and residences, and that the Government forests, on the other hand, suffered much by the undefined and irregular cutting of their bettas or coppices, which had gradually encroached on the forests, to the destruction of more valuable timber. Mr. Wedderburn's plan of apportioning a certain proportion of coppice to each acre of garden land, on a reasonable rate of assessment, seems to have the support of the cultivators themselves, and promises to remedy the grievance on both sides, affording additional security to the Government forests, together with a considerable increase of revenue, giving to the cultivators the certainty of being able, at moderate cost, to supply themselves with the necessary firewood and foliage, and removing all feeling of uneasiness and dissatisfaction."

THE SIND FORESTS, 1858-1864

The Bombay Government assumed control of Sind at the time of the Mutiny. At that period communications in the Province were very inadequate, river transport forming the only connection between Karachi and the Punjab, the journey from Multan to Karachi by river for the transport of stores occupying perhaps from four to five weeks. At this period both the population and industries of Sind were comparatively small.

The forests, however, had played some considerable part in furnishing timber to Bombay, especially Babul (*Acacia arabica*) timber to the gun-carriage factory. It is recorded that many hundreds of excellent babul logs of 20 to 25 cubic feet each were annually supplied to this factory, and also to the Karachi Port Trust. Extensive gregarious tracts of babul forests containing large-sized timber had existed during the first half of the century, but they were gradually cut out without any consideration being paid to their maintenance by systematic treatment as a permanent source for the production of this timber. These forests existed on the old riverain Shikargars of the Amirs of Sind, and were said to have contained some of the finest gregarious tracts of babul in the East. Their final exhaustion appears to have taken place in order to supply the thousands of babul sleepers required in the construction of the Karachi harbour works. During the period here dealt with the Sind Forests were yielding up their last supplies of this large-sized timber.

It has been previously noticed that the Sind Forests extended over an area of 700 square miles, and were worked under a set of Rules with a forest staff under a European Forest Ranger, as he was then designated. Mr. N. A. Dalzell occupied this position at the commencement of the period here dealt with.

The total cost of the establishment was Rs.2194 per month, the cost of supervision being, therefore, about Rs.3 per square mile per mensem.

The total receipts for 1858-9 were Rs.72,150, and the net profits Rs.28,994. For 1859-60 the receipts were calculated at Rs.90,000, and the net profits at Rs.40,000.

The net profits, said Mr. Dalzell, had always been a little more than the cost of establishment. He had calculated that for the year 1859-60, for every rupee expended in establishment Government would receive back Rs.2.6.7.

In 1860-1 the receipts were Rs.1,20,624, and the expenditure Rs.61,216, the profits being Rs.59,408.

In commenting on these figures the Secretary of State in a Despatch (March, 1861) referring to Captain Hamilton's Reports for 1855-6 (*vide p. 279*), when grave fears existed that the fuel supplies for the Indus Flotilla would soon run short, said that that apprehension he was happy to say had passed away. But though there was not likely to be, for many years to come, any deficiency in material, "still the difficulty of pro-

curing it in a state for burning still exists, and is, of course, likely to increase, from the impossibility of supplying the demand by human labour. This difficulty can only be got rid of by the introduction of machinery, and Mr. Dalzell has suggested that saw mills should be employed. Considering the increasing demand for fuel for purposes of traffic by water and land, the saving that would be effected in procuring it, and the vast difference between the price of wood fuel, even at this moment, and that of coal, I have determined to follow the recommendations of Mr. Dalzell. I accordingly authorise you to indent for two saw mills of such a size and power as, after consultation with Mr. Dalzell and your Chief Engineer, you may deem suited to the object in view. This indent should be sent home with as little delay as possible. I am convinced that, under proper management, these saw mills may be made, at least, to repay the original cost of sending them out."

The Bombay Government did not give effect to these instructions, but sanctioned instead the purchase and establishment of a saw mill in the Flotilla yard at Kotree. In July, 1862, the Secretary of State, whilst admitting that this step might prove "a measure of good economy," said that "it did not seem to accomplish the objects which the Conservator of Forests (Dalzell had been transferred to Bombay as Conservator) had in view when he recommended the introduction of steam machinery into the forests of Sind or which I contemplated when I adopted his recommendation. That object was not, as seems to have been understood by the Engineer Officers whom you consulted on the subject, the reduction of the timber into planks, etc., for building and other manufacturing purposes, but the sawing up into logs for fuel, for the use of steam traffic, of the vast quantity of babul timber, which is now uselessly cumbering the ground in the forests of Sind, but which, by the aid of steam-sawing machines, might be sawn up into logs and billets, and stacked at stations where they would be readily accessible for use." The Secretary of State had previously consulted Dalzell, who was at home on furlough, and Captain Daniell, Indian Navy, on this matter, and he asked the Bombay Government to again reconsider the question of introducing sawing machinery into the Sind Forests.

The Annual Report for 1861-2 showed a slight falling off in the receipts, due to a decrease in the grazing fees realised,

but also a decrease in the expenditure, thus giving an increase in the profits compared with 1860-1—the figures being, Rs.1,18,653, Rs.57,409 and Rs.61,244 respectively. An increase in the revenue obtained from firewood, babul pods and lac was reported. It was said that "much land uselessly included within forest limits by the ranger in former years had again been made over during the year to cultivators," the total area (including 4000 beegas of arable land) amounting to 14,485 beegas. Compensation had also been given for the land kept within forest limits. The settlements of the claims of those whose lands had been taken for forest purposes had not yet been completed. The question of the irrigation of the forests was receiving consideration. It appears evident from this Report that all the fine babul timber had not yet been cut out, as it is stated that, "During the season 40 logs of fine babul timber were sent to Bombay for the use of the Gun-Carriage Manufactory. The Agent for gun-carriages has stated that, so far as he can judge, 'from outward appearances before the logs are cut, the logs are, from shape, size and length, etc., of unexceptionable quality.' 'If Sind,' he adds, 'can produce such babul as this, the question of supply is at once settled, for it is found here in working Sind babul that it is closer-grained, more tough and durable, than the same wood from the Deccan.' "

Mr. Fenner, who had succeeded Dalzell as Forest Ranger, commented upon the great damage done to the forests by the violent floods on the Indus, and suggested that the former might be protected in some cases by the erection of bunds. The Secretary of State, in reviewing this Report (November, 1863), requested the Bombay Government to "instruct the Commissioner to consult with the Forest Ranger, and some person conversant with the science of engineering, and with the peculiar character of the Indus and the nature of the country through which it passes, to see if some method cannot be devised by which the evil may be greatly mitigated, if not wholly averted." The Secretary of State regretted that the scarcity of firewood was again felt in Sind and that such scarcity was likely to increase. This scarcity, said the Despatch, "has been the subject of many of the Despatches to your Government (i.e. Bombay) from this country since the year 1856, and I have as yet received no reply to my Despatch of 31st July, 1862, on the subject of utilising the babul logs in the forests by the introduction into the forests

of small and easily movable sawing machines. The formation of tamarisk plantations would, considering the rapidity of vegetation, probably be a very useful measure. This article, which in 1857-8 produced a revenue of only 14,497 rupees, last year I perceive produced Rs.69,189. The subject is so highly important for the supply, not only of the inhabitants, but also of the large and increasing requisitions of steam power, that it deserves your earliest and most serious consideration."

In the Report for the following year there was a still further decrease in the total receipts which amounted to Rs.97,663, the expenditure was Rs.56,834 and the profits Rs.40,828. The decrease in receipts was due to the smaller demand for fire-wood consequent on the abolition of the Government flotilla on the Indus, and to the loss in the sales of babul pods owing to the damage caused to the trees by swarms of locusts which invaded and preyed upon the country during the year. The Forest Ranger reported that the only species of tree which was not attacked was the Neem (*Melia indica*). It was hoped that the service of boats which was being started by two river companies would result in an increased demand for fuel. A native contractor during the year set up a "steam-saw," and prepared babul sleepers with it, an enterprise which received the warm approbation of both Governor and the Secretary of State.

The forest receipts showed a great upward leap in 1863-4, the gross receipts amounting to Rs.1,82,860, thus exceeding those of the previous year by Rs.84,597, and showing a net profit of Rs.73,909 after deducting expenditure. The increase was attributed to the large demand for building wood and fuel, and "to the revenue from cultivation within forest limits," the latter apparently of the nature of a land revenue, and scarcely to be termed "forest" revenue. The item which showed the chief increase was fuel, Rs.77,166, the steamers of the river companies having now commenced to ply on the river.

A Report from Mr. G. Strettell, in charge of the Sukkur division, was also submitted with the Sind Report. The settlement of all of the claims for land against the Forest Department had not yet been completed. During the year it was stated that the Sind babul seed had been successfully introduced into Guzerat.

The Annual Reports of the Sind Department had dealt more with finance and profit and loss than with true forest

conservancy, and Mr. Fenner annually received high praise for his success in this direction. In his review on the present one, however, the Governor said, "of subjects previously mooted, notice should be made of the occurrence or otherwise of fires, the efforts made to introduce new varieties of trees, the thinning and pruning of forests, and the progress of nurseries for young trees."

The following year, 1864-5, witnessed a still further increase in revenue, chiefly under firewood. When the backward state of many of the Provinces in India, in the matter of the realisation of a revenue from the forests, to which Government had every right and claim, is taken into account, the progress made in Sind at this period was remarkable. The following comparative Statement of Income and Expenditure in the Sind Forest Department for the year 1864-5 compared with 1863-4 is of considerable interest :

Items.	1863-64.			1864-65.		
	Rs.	a.	p.	Rs.	a.	p.
Grazing fees	28,639	2	0	32,889	13	11
Building wood	21,252	13	8	36,909	10	2
Firewood	114,270	7	6	169,266	11	6
Jow	537	7	4	849	10	0
Charcoal	899	5	7	651	12	10
Fisheries	1684	13	2	2015	3	2
Reeds	497	12	0	433	10	7
Kahs	152	6	0	199	8	6
Grass	59	4	8	68	7	9
Mangoes	478	8	0	375	0	0
Seeds	360	4	0	..		
Lac	711	0	0	1209	0	0
Honey	59	0	0	69	0	0
Fines	1083	2	3	1064	0	6
Babul pods	4545	0	0	5160	0	0
Land revenue from cultivation within forest limits	7130	4	10	15,116	5	9
Total	182,360	11	0	266,277	14	8
Expenditure	108,451	6	10	160,762	0	4
Net profit	73,909	4	2	105,515	14	4

The Commissioner of Sind in commenting on the above said :

"It is satisfactory to find that the Sind babul has been so extensively used for sleepers on the railway, and that after a

trial of two years they are reported to have suffered very little from the ravages of white ants, etc.

The demand for firewood continues unabated, both among the inhabitants of the principal towns in Sind and the two flotilla companies plying on the Indus. In the seventh paragraph of my letter, No. 212, dated 7th November last, submitting the Annual Report for 1863-4, I briefly stated the causes which led to the increase in the receipts of the past year, and I quite agree with Mr. Fenner in his proposal to continue to charge Rs.18 8a. per 100 maunds, so long as no considerable reduction takes place in the rates for labour and water carriage.

The beneficial results which have been anticipated from permitting cultivation within forest limits, have been fully realised in the large receipts which have accrued from this source during the year under report. The wisdom of this measure will be apparent by reference to the Forest Report for 1862-3, in which no revenue at all was shown under this head. In the following year, 1863-4, the sum of Rs.7130 4a. 10p. had been collected, while in the short space of two years since the restriction to cultivate was removed, the realisations amount to Rs.15,116,6 5a. 9p., being in excess of the past year by Rs.7,986 10a. 11p., or more than double those of 1863-4.

From the twenty-fourth paragraph of the forest ranger's report it will be seen that the inquiry into the long-pending claims on forest lands in the Hyderabad collectorate has been closed, and that no further delay will take place in settling the question of compensation to be awarded to the several parties concerned."

In a Resolution on this Report the Governor in Council expressed the greatest satisfaction at the continued progress made in the division, and also on the interesting remarks regarding the irrigation and thinning of forests, the protection of young trees, the establishment of nurseries, and the occurrence of fires which were contained in the Sind and Sukkur Reports; but he added a warning with respect to the cultivation permitted within forest limits by which a revenue of Rs.15,000 had been realised. "The Commissioner should be requested to bear in mind that it is far better to sacrifice a comparatively trifling amount of present revenue rather than run the risk of injury to the forests, and that if there is any chance of the latter result the restriction should be at once reimposed."

CHAPTER XX

THE INTRODUCTION OF FOREST CONSERVANCY IN BURMA, 1858-1864

SIR D. BRANDIS' WORK

AS has been mentioned in a previous chapter, Brandis was appointed Superintendent of Forests in Pegu in January, 1856, and in 1857 the forests of Tenasserim and Martaban were added to his charge.

For the sake of continuity and to exhibit in the most striking manner Brandis' first years of work in India it has been deemed advisable to deal with these years consecutively, although the work commenced a year before the period here dealt with.

It has been shown that Wallich, as early as 1827, Captains Tremenheere and Guthrie in 1843-5, in Tenasserim, and more recently McClelland in Pegu, had framed for their times some sound proposals for the working of the forests, proposals which were never given a real trial or supported by Government.

With a knowledge of what had taken place before he arrived, and the attempts which had been made to introduce some form of forest administration and protection in Burma, Brandis commenced the brilliant work which was to introduce an ordered forest organisation into Burma.

The following account of this work, with some modifications and additions by the writer, is based upon the Article on the subject in the *Indian Forester* (Vol. X, August, 1884).

Immediately after his arrival Brandis proposed to himself three questions as the first groundwork to the introduction of a sound administration into the Pegu Forests. These questions, simple in themselves, proved at once that the Government had secured the services of an officer of uncommon ability and judgment; and the way in which the answers to them were worked out, in spite of great difficulties, at the cost of untiring labour and severe hardship with utter disregard to

personal comfort and convenience, must elicit the highest admiration.

The questions were :

- (1) How can the produce of the forests be turned to account in the most advantageous manner ?
- (2) What measures must be taken for the preservation of the forests ? and
- (3) What can be done for the extension and consolidation of the forests ?

To answer the first question it was necessary to form some estimate of the amount of timber the forests would be able to yield without deterioration, and the first step taken was to make a valuation of the growing stock.

In this work Brandis set a sound example, and introduced a system of valuation surveys, so eminently adapted to the circumstances, that with but slight modifications it is still in force up to the present day.

"Linear Valuation Surveys," it is thus Brandis named his method, excels by its simplicity. The trees along certain lines, roads, ridges, streams, or lines chosen across country, are counted, classified according to their girth, and ticked off on small pieces of bamboo, split into thin strips, each of which is again notched into ten pieces, which can be turned down one by one. Different pieces are carried for the different classes of trees. This device is extremely useful in a country like Burma, where on account of rain or dew it is often difficult to use a pocket-book.

At the beginning all trees that could be seen from the line traversed were counted, but though this method gave a fair idea of the character of the forest, it was soon found that it was preferable to substitute a fixed distance, in order to obtain a fixed factor on which a somewhat more accurate estimate for the rest of the forest areas under observation could be formed. The distance on which the trees were thus counted was at first fixed at 100 feet, but subsequently, on account of the frequently extremely dense growth of the Burmese Forests, it was reduced to 50 feet on each side of the line traversed.

Brandis made the teak, which at that time was the only tree the extraction of which was at all remunerative, the main object of his observations, and divided the trees at first into four classes :

- I. Trees of 6 feet (4 cubits) and above in girth.
- II. Trees of 4 feet 6 inches to 6 feet (3-4 cubits).
- III. Trees of 3 feet to 4 feet 6 inches (2-3 cubits).
- IV. Trees under 3 feet (2 cubits) girth and seedlings.

Subsequently these classes were re-arranged, and all trees down to 1 foot 6 inches were included in the third class, leaving only those below 18 inches in the fourth class.

During the first year's observations Brandis found that the numbers of trees in the first three classes were very nearly equal in all but recently worked forests, and having thus obtained some idea of the proportion of the different classes, he proposed to himself the principle that, in any forests to be worked out, as many first class trees as would be replaced during the year by the growing stock of second class trees, could and should be felled in that period.

Here we have the fundamental principle on which all working plans must *prima facie* be based.

To estimate the number of second class trees that would each year attain first class dimension, it was necessary to ascertain the rate of growth of teak. Brandis was too cautious to accept without further proof the theory of annual rings representing one year's growth, and augmented his data by the measurement of a few trees, the age of which was known.

From the data at his disposal he constituted the following table :

<i>Girth in feet.</i>	<i>Age in years.</i>
3 feet	18
4 feet 6 inches : : : .	39
6 feet	62

On this table, which came about midway between data regarding the growth of teak obtained from Bombay and Java, he decided to base his working plan, until better ones should become available.

The Superintendent accordingly laid down that one twenty-fourth of the first class trees in each forest might annually be cut, and assumed that as the number of fourth class trees had been found largely to exceed those in the other classes, the forests would gradually improve under the proposed system of working, and become richer in teak than they were in 1856. This assumption has since proved true ; at least, whenever the forests have been worked by direct Government agency.

The plan of thus felling and extracting one twenty-fourth of

all first class trees annually in each forest was open to practical objections, both on the score of labour and supervision. On account of this Brandis arranged the Pegu teak forests in six divisions, each of which he worked in turn, girdling every sixth year one-fourth of the first class trees in one division.

He next prepared an estimate of the probable outturn of the Pegu Forests. The linear surveys, it was calculated, covered an area of thirty square miles, and on these 2,423 first class trees had been counted, or an average of about 80 trees per square mile. It was roughly estimated that the total area on which teak was scattered in Pegu amounted to 7000 square miles, and a grand total of 585,000 first class trees was accepted. Thus, in theory, the outturn could have been fixed at 24,000 trees per annum ; but Brandis recognised that many of the trees were growing in inaccessible localities, or, for other reasons, were of insufficient value to prove saleable, or to pay for their removal, and he consequently reduced the estimate to an average outturn of about 24,000 logs per annum.

Many alterations were subsequently made in the estimate, most of them by Brandis himself, or under his immediate supervision, as the whole of the forest area became better known and data on which to base calculations more plentiful ; but on the whole the close estimate he managed to make of the resources of the Pegu Forests within a year of his arrival in the country is remarkable.

As regards the method of working the forests, Brandis had the following three systems to choose from :

(1) The levying of a duty on every log brought from the forests, the felling of the trees being either free or restricted to the holders of a permit or grant.

(2) Selling the whole of the seasoned timber in a certain forest to the highest bidder.

(3) Bringing down the timber from the forests on account of Government, and disposing of it by periodical sales to the highest bidder.

The Superintendent recognised that the first system then actually in force in Burma must cease, as it would inevitably result in the ruin and destruction of the forests. Of the alternatives he recognised that, provided the marking and girdling of the trees to be felled remained in the hands of the Forest Department, the second system was theoretically more correct than the third, as it encouraged private enterprise, and

left the Forest Staff free to devote their time to general forest administration, and to the preservation, extension, and consolidation of the forests.

The prices, however, which were offered for the timber in the forests were so low, that it would not have been remunerative to sell. Also, whenever this mode of working had been introduced it had proved to be wasteful and unreliable. Moreover, it had already been abundantly exemplified that private parties who had only a temporary interest in the forests, were not likely to undertake on an extensive scale works which had, of necessity, to be undertaken to thoroughly open out the forests, such as clearing of obstructions, blasting and road making; nor in the past had they ever paid the slightest attention to reproductive measures.

From the description already given of the methods on which the licence-holders worked the Tenasserim Forests, with which Brandis had made himself thoroughly acquainted, it will be readily understood why he adopted, from the outset, as a fundamental principle admitting of no departure, that Government alone must be responsible for the opening out of the forests, and their future maintenance by the introduction of means to ensure natural regeneration.

Considering all these points, the Superintendent arrived at the conclusion that Government must show the way to working the forests on an improved and less wasteful system. He placed, however, on record at the time, that once a permanent improvement in the working had been effected, the system of departmental working might safely be changed for one of selling the timber in the forests, provided reasonable prices were offered for the seasoned timber.

Brandis, therefore, tried to work the forests on Government account by means of contractors, who were to fell the timber, drag it to the floating streams and raft it to the sale dépôts. He was at the outset met by difficulties, for no local contractors were forthcoming. He surmounted this obstacle by importing contractors from Moulmein, selected energetic men in Pegu, or wherever he could find them, and succeeded in bringing some 13,000 logs to dépôt during the very first season, though he was beset by all sorts of impediments, as both his subordinates and his contractors were constantly trying to overreach him. Government marks were erased, and some of the timber was sold, instead of being delivered at Rangoon; some first class Government logs were exchanged against

an equal number of inferior logs belonging to private parties and so forth. Even near the Rangoon dépôt the timber was not safe, whole rafts were detached during dark nights, and, borne away on the strong tides, were taken to hiding-places amongst the numerous creeks and backwaters. In one of the Sittang Forests, the contractors dragged a portion of the Government timber across the frontier, and afterwards re-imported it as foreign timber.

The forest subordinates and contractors and the population living on the banks of the floating streams had all combined, but their tricks were found out one by one, and their robberies were discovered and punished, and measures were invented and adopted to check and prevent the systematic cheating and theft. It took years to break up the combinations that were formed to rob Government, but the system introduced by Brandis in 1856 has since been elaborated, and the Pegu Forests were subsequently worked by contractors on Government account with the most satisfactory results.

For some years the second of the above-mentioned systems, the exploitation by private enterprise, was introduced in consequence of a strong agitation on the part of the leading merchants and under pressure from the Local Government, but the trial resulted in a failure with regard to finance as well as forest conservancy.

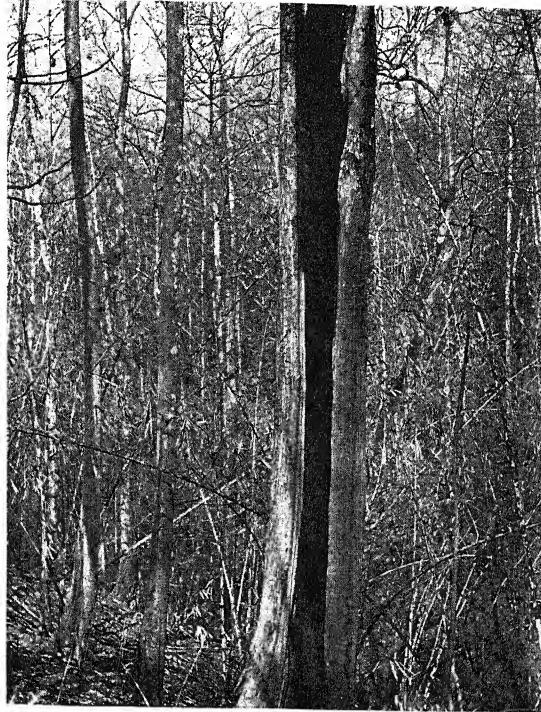
Brandis having thus created a system for the working of the Pegu Forests, and proved, as far as proof was at that time possible, that its operation if faithfully carried out would not endanger their preservation, next proceeded to take steps for the preservation of the forests against other causes.

These measures he classified under the following heads :

- (1) Protection against injurious and irregular felling.
- (2) Protection against jungle fires.
- (3) Protection against toungya or hill cultivation.
- (4) Protection against natural causes, such as creepers, parasites, shade of the trees, etc.

With a view to enforcing a proper protection of the forests, a set of twenty-two Rules were published in October, 1856. These Rules, the first drafted by an experienced trained Forest Officer for working the Indian Forests, are of considerable interest and importance since they formed the basis on which forest administration was introduced throughout India. Cleghorn in Madras and others elsewhere worked on





DAMAGE DONE TO STEM OF TEAK TREE BY FIRE. BURMA
A. Rodger in "Indian Forester," Vol. XXXIII

lines based on these Rules. It is of interest, however, to compare them with the Forest Rules drafted by Conolly in 1843 (*vide p. 91*).

Brandis' Rules were as follows :

(1) The forests of the Province of Pegu, being the property of Government, the following rules are published for their conservation, and in order to ensure success for the measures taken for their future extension.

(2) The officers appointed for the administration of the forests are :

(a) The Superintendent.

(b) The Assistants in Districts.

(c) Goungs (Foresters) and Goung-gwais (Forest Guards) in Forest Tracts.

(3) No person is permitted to girdle or to fell any teak tree, large or small, except by the express orders of the superintendent or his assistants.

(4) No person is permitted to cut or break off the branches of teak trees, or otherwise injure them.

(5) Other trees besides teak, which may have been girdled by order of the superintendent, are likewise neither to be felled nor removed, except by orders from the same officer.

(6) The felling, or dragging of trees, which any person may be permitted to remove from the forest, must always be done in such a manner as not to break or injure any teak trees.

(7) No person shall remove, or cut in pieces, or otherwise deface any teak log lying within the boundaries of any forest, except by order of the superintendent.

(8) No person is permitted to set fire to any teak timber, standing or felled.

(9) Should, therefore, natthat or seasoned timber, or logs, be found in a place selected for a toungya or hill plantation, the men who intend working the toungya, before doing so, must fell and remove the same to such distance that the fire of the toungya cannot reach them.

(10) In the case above mentioned (No. 9) no special permission is required for the felling or removing of teak timber to form toungyas ; but information must be given of this having been done to the nearest goung-gwai, who is ordered to visit every village in his district soon after the rains.

(11) No toungya is to be formed on any spot of ground on which stand any number of teak trees exceeding fifty (large or small), seedlings included. In special cases, the superintendent or his assistants may grant permission for toungyas to be formed in such spots where it appears to them that the teak cannot be made available for the use of the forest department.

(12) Nurseries or plantations formed by order of the Superintendent of Forests are not to be injured in any way.

(13) Whenever the superintendent or his assistants may think it fit to reserve any tract in the forest, no tree, shrub, or dead timber in the said tract is to be injured, felled, or removed, except by the servants of the forest department. No tract of a size exceeding ten acres is to be thus reserved without the special sanction of the Commissioner.

(14) Whenever the Superintendent of Forests, or his assistants, may find it necessary to mark trees of any kind with the Government mark, such trees are neither to be cut or injured in any way.

(15) Poles or other signs put up to mark the boundary of a reserved tract, or for other purposes; likewise sheds, bridges, fences, or buildings of any kind, together with roads and ditches, erected or made by orders of the Superintendent, are not to be removed or injured in any way.

(16) It will be the duty of the forest goungs and goung-gwais to see that these Rules are not violated; and should they in any case be infringed, to report the same to the Superintendent or his assistants.

(17) Private parties in the districts near the forests, and at a distance from the principal rivers, who may be desirous of purchasing teak timber for their own use in the district, may obtain the same by applying to the Superintendent. If the application can be granted, orders will be given to the forest goung-gwais to point out the trees or logs available for the purpose. The purchasers will have to fell and to remove the timber within a fixed time. The price to be paid for the same will be settled by the Superintendent, and one-fourth of it is to be paid before any timber is felled. If the timber be not removed within the time specified, it will be liable to be confiscated, and the amount paid in advance forfeited.

(18) Permission to bring away branches of felled trees or other small pieces of timber, such as slabs cut off from squared logs, or the stumps remaining after the tree has been felled, will be given to parties applying for the same on their depositing a certain sum as a security, and on payment of a fixed price for one year's grant, in one forest district. The grant, however, as well as the deposit, will be forfeited in case the parties bring away or destroy any timber besides that stipulated for.

(19) Parties residing in the districts near the forest, and at a distance from the principal rivers, who may be desirous of obtaining teak timber for the erection of buildings for religious purposes, or the common benefit of the public, as Christian churches or chapels, schools, kyoungs, zayats, bridges, etc., may apply for the same through the local authorities to the deputy or assistant commissioner of the province. The latter, in case he finds it advisable to recom-

mend the application, will forward the same to the Superintendent of Forests, who will decide whether any or the whole of the timber required can be given out of the Government forests. The applicants, to whom the timber available will be pointed out by the forest goung-gwais, will be required to fell and remove the same to the place where it is to be used, within a fixed time. Timber for these purposes will be given gratuitously; but on the expiration of a year from the time of the timber being made over to the parties, an account will be called for by the Superintendent of Forests, showing how it has been used. Should it not have been applied for the purposes specified in the application, he will be at liberty either to take possession of the timber, or to impose a fine on the parties concerned, equal to twice the average market value of the timber.

(20) Any person who infringes any provision of the forest rules, or any subordinate of the forest department who wilfully neglects his duty, will be liable to a fine not exceeding two hundred rupees, and on default of payment, to imprisonment for a term not exceeding six months, without labour. In cases where the infringement involves theft of timber, the offender will be liable to be proceeded against in the criminal court.

(21) All cases of violation of the forest rules may be tried and decided by the Superintendent of Forests, either by personal inquiry into the facts, or on the record of inquiry made by a forest assistant. In any case the decision, and the grounds for it, shall be recorded, and the same will be open to appeal to the Commissioner.

(22) Whenever a person is sentenced to fine, and in default to imprisonment, by the Superintendent of Forests, the person so sentenced shall be forwarded without delay to the officer in charge of the district within which the offence was committed, together with a copy of the sentence, and the said officer shall forthwith proceed to execute it.

With regard to jungle fires Brandis drew special attention to their injurious effects by :

- (a) Destroying or damaging timber seasoning in the forests.
- (b) Destroying or, at any rate, cutting back seedlings and young trees.
- (c) Destroying large quantities of teak seed, and thereby retarding reproduction.

Brandis did not, however, at that time (1856) see his way towards preventing these jungle fires.

As formidable an enemy as these jungle fires was found in the system of temporary cultivation universally practised by

the hill tribes in Burma, as well as by the inhabitants of the plains when living near large forest areas.

This system, called "toungya" in Burma, consists in the clearing of the forest ground by axe and fire. The young trees, bamboos and other undergrowth are felled, and the larger trees are lopped and frequently killed by girdling. The vast quantity of timber and brushwood on the ground is then allowed to dry, and is ultimately fired. The few trees that may have escaped the axe are either killed, or at least permanently injured, during the fierce conflagration, in witness whereof hundreds of thousands of dead trees charred and with bare blackened branches were to be found all over Burma. The area thus barbarously cleared is sown and abandoned frequently after one, certainly after a few years' crops have been obtained. As soon as left to Nature, the land clothes itself with a dense growth of herbs and grasses, etc., and for years till this growth gets less dense, and again permits of true growth, no teak seedlings can, unaided, spring up in and penetrate the dense jungle growth.

To prevent as far as possible the evil effects of toungya cultivation, it was ruled that no toungya be cut on any spot which contained more than fifty teak trees, large and small, and that dry standing trees and felled teak timber should be removed beyond the effects of toungya fires.

Brandis, moreover, recognised that the very system which, till then, had destroyed teak forests might be utilised to produce them, or at least to ameliorate their character, and as early as 1856 an attempt was made in the Prome district to sow teak in regular rows, together with the rice scattered by the toungya cutters.

Twenty years afterwards this attempt had grown into a regular system, by which areas were being annually stocked with teak at a cost far below that of regular plantations.

The Superintendent also commenced at the very outset to wage war against the evil effects upon reproduction and growing stock caused by creepers, parasites and the shade of inferior trees, the timbers of which he contemplated introducing on the market so as to pay for the expense of removing them. He worked steadily in this direction, making experiments regarding the qualities of other woods, and publishing accounts thereof, and, though he himself did not succeed in his aim, he prepared the way for his successors, and in later years considerable revenue was made from trees other than teak.

The last question before Brandis was : " What can be done for the improvement, extension and consolidation of the forests ? "

This he dealt with under the following heads :

- (1) Pruning.
- (2) Plantations.
- (3) Nurseries in toungyas.
- (4) Scattering seed in cleared portions of the forests.
- (5) Consolidation of the teak forests.

Pruning he considered at that period still impracticable, but experimental plantations were made in localities specially selected, forming the nucleus of extensive plantations in future years.

From the outset Brandis was an advocate of the system of planting in lines in preference to any other method, and of raising a mixed forest, and not one of pure teak. The advantages of line planting are great, but future experience has shown that a distance of 6 by 6 feet more effectually checks the growth of young bamboos.

The third method recommended by Brandis, that of scattering seed in the forest, in later years was developed into a markedly successful system. Large areas over which the bamboo had flowered were cleared by fire, and cultivated before a jungle growth had sprung up, and this proved the cheapest of all modes of cultivation. Brandis' successors, especially as regards reproduction, have faithfully proceeded on the lines sketched out by him as early as 1856, and the reproduction and welfare of the Pegu Forests have been doubtlessly insured thereby.

The Superintendent found very soon that one of the chief obstacles to successful forest management was the scattered distribution of the teak trees, some 500,000 marketable trees being scattered over 7000 square miles, and he very rightly at once urged the consolidation of the teak localities. His idea was to select the better tracts, and to convert them by protection, sowing and planting into localities containing mainly teak forests, so as to concentrate operations upon a smaller area, and thus make the construction of roads and other works financially remunerative.

This idea formed the basis to our present system of reserved forests.

During 1857 and up to July, 1858, Brandis devoted his

attention mainly to the administration of the Pegu Forests situated between the Sittang and Irrawaddy on the principles already noted. He enforced the forest Rules, checked wanton destruction of teak, and regulated or prohibited the formation of toungyas in teak localities, without causing dissatisfaction amongst the Karens and other forest tribes : he carried out considerable forest improvements, and started numerous small plantations. He found it at that time still impossible to induce villagers to sow teak in their toungyas, but he clearly foresaw the future importance of that method of restoring the forest, and wrote : "This, if the people can ever be brought to do it, is likely to become the most efficient mode of planting teak in this country."

Great improvements were also made during the time in the dragging, rafting and floating of the timber, and in July, 1858, Brandis was able to leave the executive work of the Pegu Forests in the charge of the assistant officers he had appointed for a sufficient time to permit him to examine the Attaran Forests.

The first result of this examination was a most interesting and instructive Report.

"The teak forests of this Province," Brandis pointed out, "are not extensive well-defined tracts covered with one or a few species of trees, all useful and valuable, or nearly so. Teak trees are found scattered in a forest, mainly consisting of trees of other kinds, all at present valueless, or nearly so, if compared with teak. Teak trees are either found *singly*, scattered over a wide extent of ground, or they form isolated groups of *a few trees only* ; or, lastly, teak is one of the *regular constituents* of the forest bearing a variable, but mostly small, proportion to the trees of other kinds.

"Localities where teak occurs are designated as *teak-producing tracts*. Between them there are others without any teak in them, and frequently bearing a forest consisting of a class of trees altogether different."

The teak-producing areas had, therefore, first to be found in the enormous forests which covered British Burma, and the two questions :

(1) "What is the area of teak-producing tracts in Tenasserim ?" and

(2) "What is the amount of teak on teak localities within a given area ?" had to be answered.

Brandis had again recourse to linear surveys.

At the time the Attaran Report was written the valuation surveys actually covered an area of $42\frac{1}{2}$ square miles, which necessitated linear surveys of over 800 miles in length.

Brandis found that in the teak-producing forests in Attaran the teak tree formed about one-tenth of the whole *peuplement*, and that the different age classes of teak bore the following average proportion per mile :

1st class	.	.	.	.	.	147
2nd „	.	.	.	.	.	100
3rd „	.	.	.	.	.	205
4th „	.	.	.	.	.	548
<hr/>						
Total	.	.	.	.	1000	

These observations confirmed those made in the Pegu Forests in 1856-7 as regards the general character of Burma teak forests. The Attaran Report contains an extremely clear and useful description of the different varieties of teak-producing forests, and their classification noted down by Brandis in 1858 still remained the standard for many years afterwards.

Space will not permit of a detailed review of the Attaran Report and its interesting description of the Attaran Forests. The history of their administration under British rule has been already discussed, and the manner in which the conditions attached to the leases were openly flouted, owing to the supine methods of the Government.

Brandis quickly dispelled the hope which had been entertained that all former wastefulness could be easily repaired by artificial cultivation, showing the enormous cost of extensive plantations in unhealthy localities rendered infinitely more difficult by the almost total absence of local labour.

Of the future of the Attaran Forests he took a somewhat gloomy view ; in fact, he thought that the best use that could be made of them would be to serve as a warning example to the rest of India of the deplorable results of private working ; and all he proposed was that the boundaries of leased forests should at once be clearly defined, and that forests under leases and those still at the disposal of Government should be separated. He initiated those steps by which all that could be saved of these once most valuable forests was saved, and

prepared the way for the gradual resumption of the leased areas.

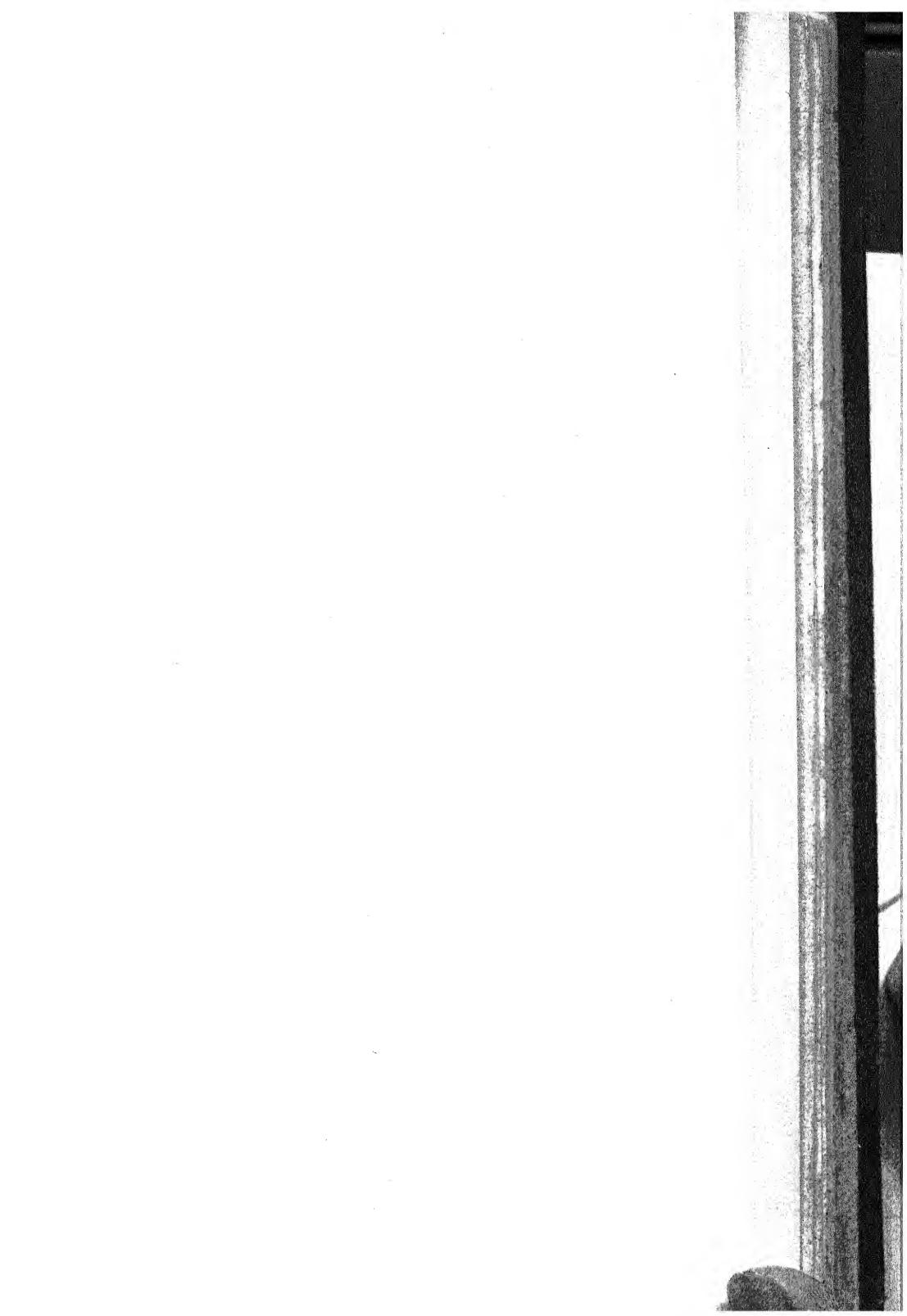
During the following years Brandis promulgated a revised and more comprehensive set of forest Rules, which were sanctioned in December, 1858. The control of the drift timber was placed in the hands of the Department, a step which hereafter yielded not only handsome profits to Government, but secured honest traders from timber piracy and heavy losses of timber in transit; though at the time this step found strong opposition, for it affected the interests of the few only.

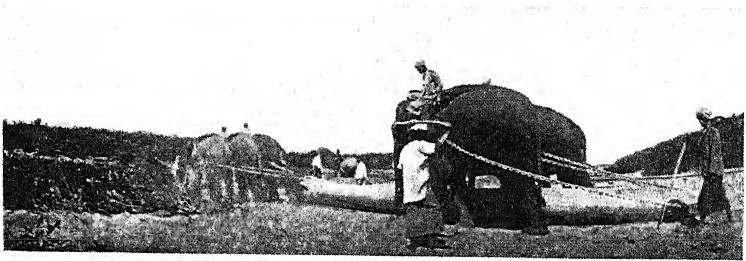
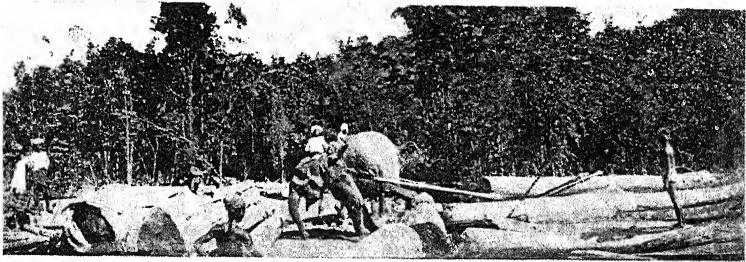
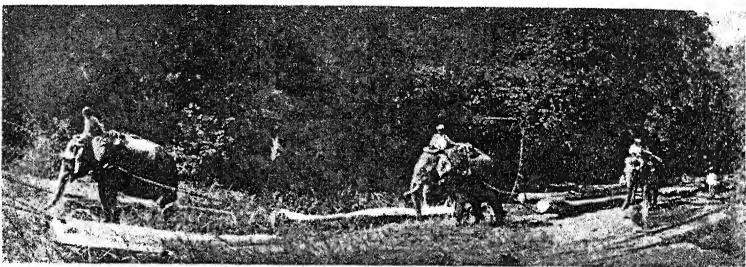
Towards the end of 1859-60 the clamour to permit private enterprise to exploit the teak forests became more pressing. At this time Brandis was somewhat disheartened with the general financial results of the first four years' working, which he considered at the time in no way adequate to the toil and anxiety the work had entailed. He expected more rapid returns from his arrangements, and took a much more gloomy view of the financial state of his operations than was justified by subsequent events.

This combination of circumstances led to the introduction of the permit system. Brandis introduced the system as cautiously as possible, and bound the permit holders by extremely rigid provisions; but in spite of all precautions it turned out to be another proof of the inadvisability of leaving the exploitation of forests in the hands of speculators. Excellent Rules were made to regulate the girdling of teak trees, and as only timber seasoned by the Forest Department was sold to the permit holders in the Pegu Forests, this precaution was thought to dispose of any apprehension in that direction; but it was subsequently found that the very girdling operations were influenced by the agents of a large Rangoon firm. At the time, however, when Brandis was pressed to yield with regard to the permit system, he retained the most valuable of the Tharrawaddy Forests, and introduced the system of loaning Government elephants to deserving contractors instead of making money advances, and this method formed subsequently the groundwork of all exploitation by direct Government agency, except in a few rare cases where large capital, content with reasonable profits, stepped in.

The introduction of this method was to give to the Forest Department in the future both greater profits and more power than any other measure introduced.

Throughout these years Brandis paid the greatest attention





ELEPHANTS DRAGGING TEAK LOGS. BURMESE FORESTS
From Research Institute Collection, Dehra Dun

to the improvement of the export lines from the forests, by clearing away obstructions and digging canals, amongst which the Schwaylay Canal is the most important. This canal opened out a considerable forest district. All these improvements shortened the time it took for timber to reach the market from the forests, and lessened the chances of its being lost on the way.

The Rangoon Depôt was formed into a central market, at which periodical sales were held, and the disposal of timber under free grants for churches, chapels, kyoungs and schools was regulated.

The actual forest work of the whole of Pegu was thus concentrated in the Tharrawaddy Division, and Brandis therefore considered it necessary to remove the head-quarters of the Forest Department from Rangoon into the vicinity of the forests. The old royal town of Myodwin was selected, and a large forest settlement was established. Brandis hoped that the Myodwin settlement would be the foundation of a permanent and growing location. In this he was disappointed, and hardly any traces of it are left, thanks to the rapid expansion of forest work in Burma, which demanded the retransfer of the head-quarters to the centre of government (Rangoon). Still, the choice of head-quarters for the work then in hand could not have fallen on a better place, and nothing helped more to get the work of the Tharrawaddy Division well in hand.

All this time the search for teak-producing areas and their examination was carried on with unflagging energy. In Pegu the forests west of the Irrawaddy were examined, and nearly twelve square miles of valuation surveys were made. The southern forest, including the valleys of the Pegu River, the Pounglin and the Hline, were searched through and through, and almost every teak locality was found and carefully examined and described. These forests are some of the most impenetrable and deadly (malarious) in Burma, and must be known to appreciate the energy and application necessary for their thorough exploration.

The large teak areas on the Khaboung and the belts of teak forests on the eastern tributaries of the Sittang above the Thonkyeghat were most carefully explored, valued and described, as well as the evergreen forests in the basins of Hpyoo, Koon and Bonee Streams, in which teak-producing localities are scattered here and there. These forests were only

visited by Karens and a few intrepid elephant hunters and dacoits. Their unhealthiness is so notorious, that the natives in the Shoay-gyeen district have a proverb : " He that awakens a sleeping tiger, the girl that loves a white man, and he that sleeps in Bonee Forest, will come to grief and be ruined for life."

Still, Brandis' strong sense of duty made him live for weeks at a time in these forests, and by making friends of the aboriginal inhabitants, who throughout Burma loved " Byandi thikin," he was able to explore these unknown forest areas with a degree of thoroughness which is astonishing.

In Tenasserim, the forests on the Beeling, Yoonzaleen and Upper Salween, the Lower Salween and Doomedamee, and the Thoongeen were explored during the same years, and a preliminary working plan was framed for them on very much the same principles as those originally adopted for the Pegu Forests.

The forest area was also divided into six divisions, work to be carried on in one division at a time.

The annual outturn was estimated at 8096 trees, divided amongst the divisions as follows :

	Trees.
1st Division. Beeling Forests ; probable annual outturn	1360
2nd ,,, Yoonzaleen and Upper Salween Forests ; probably annual outturn	1463
3rd ,,, Lower Salween and Doomedamee Forests ; probable annual outturn	1426
4th, 5th and 6th ,,, Thoongeen Forests ; probable annual outturn	3847
Total . . .	8096

The working plan was based on actual surveys of 20 $\frac{2}{3}$ square miles of valuation surveys, on which 83,499 teak trees were counted, including 21,532 of the 1st class ; the entire teak-producing area, excluding the upper portion of the Thoongeen above the Melgat, being estimated at 552 square miles, the rotation being fixed at 122 years.

The year 1861 was still a period of great anxiety for Brandis.

The expenditure, especially on the Pegu side, was very large, and the revenue still failed to be realised to the amount expected ; however, at the end of the year the prospects brightened, and he was able to close his Annual Report with

the words : "This is the first Annual Progress Report on the Pegu forests which I can close with a definite hope of good success at a period not far distant."

The results of the improved management of the Tenasserim Forests became also apparent, the net revenue having risen in the last three years from Rs.9,734 to Rs.73,335.

The system of loaning elephants, introduced in the previous year, had been rapidly developed, and 73 animals had been made over to contractors, the waterways were uninterruptedly cleared of obstructions, the protection of timber in transit improved, and altogether the wheels of the Department began to work more smoothly, so that Brandis expressed a hope that he would be able gradually to withdraw from executive work, a large share of which had till now rested on his shoulders. He personally conducted the extensive girdling operations during 1857 and 1858, and supervised in detail the introduction of the working of the Tharrawaddy Forests by direct Government agency.

In 1860-1 Brandis introduced the sale of permits by public auction in Tenasserim, under which the rates realised per log were raised by Rs.2 all round. Numerous forests were again explored and examined : in Pegu the forests on the Paddey and Choungoungyee, as well as the Swa, Myolah, and other frontier forests and the whole of the Shoaygyeen district ; and in Tenasserim all forests on the Beeling stream. Girdling operations were carried on under competent supervision.

During this and the following year an influential combination of merchants pressed again for the introduction of exploitation by private enterprise, and Brandis had to face an organised opposition. He saw clearly enough that the promises of the mercantile firms in Rangoon to bring European energy and skill to bear upon the working of the forests were empty words, and that natives would be employed by the firms, where natives were employed by him, and he naturally preferred those he had selected and trained, and he had to defend his principles. During that time he was attacked from all sides.

The timber brought down by the Forest Department, of which as yet only a small proportion was the result of their own girdling, was criticised as wretched and worthless, and it was said that greater vigour would be displayed in the working of the forests by private agency.

These attacks must have been extremely galling to an

officer who had spent himself unsparingly and who had toiled for five years to work the timber resources of the country on a system of strict conservancy ; but, still worse, he was left to fight the battle alone, till in September, 1861, the Governor-General in Council recognised the position and Brandis' special services. The outcome of a long correspondence, and several meetings, was that the Forest Department retained unconditionally the management of the exploitation of the Tharrawaddy Forests, and that the rest of the Pegu Forests were disposed of on twelve years' leases, specially prepared under the advice of the Advocate-General. That Government, anxious for an immediate return from their forests, were heavy losers by these transactions financially, as well as from a Forester's point of view, was proved by subsequent events.

The leases were introduced under Brandis' *régime*, but the following paragraph from a Government letter indicates the Superintendent's position quite clearly : " I am to add that the Governor-General in Council observes that great credit is due to that gentleman (Mr. Brandis) for the frank and hearty way in which the present papers show him to have acted in promoting the views of Government (opening the forests to private enterprise), though evidently opposed to his own ideas and disappointing to his hopes."

The rest of Brandis' direct administration of Burma flowed in quieter channels ; means of exploitation were constantly improved, and export lines and waterways received the necessary attention. Girdling operations were combined with more and more detailed examinations of the forests, topographical surveys of the more important forest areas were begun, and improvements were introduced in every branch of the Department, which it would be impossible to here follow up in detail.

Before leaving the Province Brandis framed a working plan for the second rotation from 1862-7. The total number of trees to be girdled in British Burma during that period amounted to 171,842.

Brandis left Burma on special duty on the 29th of November, 1862, and the permit holders no sooner felt the withdrawal of the strong hand than they began to agitate for new concessions, which were clamoured for in a letter, in which it was pointed out that Forestry carried on under Brandis' rules, and on the principles laid down by him, would in practice be destructive

of all hope of making the forests of the Province a source of revenue to Government, or a source of supply of timber, and an element of wealth and prosperity to the country. All of which statements had been several times repeated in the history of the forests of Burma.

The fallacy of the statements had been proved by events, but at the time they formed the basis of a demand which amounted to nothing less than that the permit holders should be permitted to girdle themselves all marketable timber within the limits of the forest leased by them.

This demand, which would have insured rapid profits to the permit holders at the cost of the State, was supported by the officiating Superintendent of Forests, and was submitted by the Local Government, who were moved thereto by the statement that the permit holders lost heavily by the exploitation of Government forests under the form of leases in force, which provided that all girdling was to be done by the Forest Department under strict rules and strict supervision. It cannot be gainsaid that the concentration of the timber works would have facilitated and cheapened them, but the introduction of this measure would have sealed the warrant for the destruction of the Pegu Forests, and luckily Brandis was able to point out the fallacies in the arguments brought forward, and thus saved the Burma Forests for the time being, and secured them from all future attacks from that quarter.

In a Despatch on this matter to the Governor-General in Council, dated 24th March, 1862, the Secretary of State expressed himself as very dissatisfied with the arrangements made in Burma in opposition to the advice tendered by Brandis. The Despatch is of interest, since it clearly indicates how closely the Home Government were now following forestry matters in India. The Secretary of State wrote :

"I have considered in Council your Letter of the 21st November, No. 82, in the Public Works Department, which transmitted your proceedings of the 25th of October last, Nos. 30 to 51, containing a full account of the measures taken for opening the forests in Pegu and Martaban to private enterprise.

By the documents now under consideration, I learn that you have determined on at once giving up to this purpose an area equal in extent to more than half of the forests, and containing nearly half, or, perhaps, even more than half, the number of first class trees in the Province. You refer also, in your

Resolution, to other proceedings in the Political Department, as having already decided the question as to whether the whole of the forests should be reserved in the hands of Government or not. But that correspondence was not separately transmitted to me, it was merely recorded on your proceedings. You have, however, determined and made public the arrangements connected with this important change, without any reference to the opinion of Her Majesty's Government, although the scheme is entirely opposed to the measures of conservation which have of late years been pursued on the recommendation of Dr. Brandis, and have received cordial approval from the home authorities in the Revenue Department. Considering the great interest manifested on the subject of forests in the Despatches addressed to you and to the local governments from this country, I was not prepared for such an entire change of policy being carried into effect without a previous reference to the Secretary of State in Council.

I regret this proceeding on your part, the more because I cannot entertain a favourable opinion of the expediency of so great an alteration of policy, more especially with respect to the forests to the east of the Irrawaddy.

The measure which you have sanctioned divides itself into two parts: one applicable to the forests on the east of the Irrawaddy River, and the other to those on the west of that river. In the former, Government is to grant permits, assigning certain forests to private capitalists for six years, the permit holders being restrained from cutting any trees not girdled by the Forest Department before 1860, and the timber being considered the property of Government until a fixed price has been paid by the capitalist at the Kemmendine station near Rangoon.

In the latter forests, viz. those west of the Irrawaddy, the leases are to be granted for 12 years, and include the privilege of girdling, so long as only trees not less in girth than five feet at six feet from the ground are girdled, payment to be made, as in the Eastern Forests, at fixed stations on the Irrawaddy and Bassein rivers.

At the same time that you adopted this method of working the forests by means of leases, you also abandoned many of those restrictions upon the felling and cutting of timber which, in the opinion of the most experienced officers of the Forest Department, were necessary for the due conservancy of the forests.

It was also opposed—as you state in your Resolution, and as is evident from the letters of Dr. Brandis, and from the whole tenor of his printed annual reports on the Pegu and Tenasserim forests—to the views of that experienced and zealous officer, whose practical knowledge of the subject, and incessant labours in this department for many years, entitle his opinion to great weight. Your Government appears to have concurred in the proposal more as a way of avoiding a difficulty than as a measure likely to be advantageous, and with the full conviction that the obstacles in the way of a beneficial conservancy would not thereby be diminished, whilst sufficient consideration had not been given to the best mode of meeting them, and you expressed a doubt as to whether the prohibition to cut trees undersized or not girdled by the officers of the department was sufficiently clear.

I quite concur with your Excellency in Council in the 'great doubts' which you entertain as to the fact of the identity in interest between the Government and the person to whom this permission to fell timber is to be granted. The reports which have been from time to time sent in to your Government on the Attaran Forests, and on those throughout Pegu and Tenasserim, afford, in the opinion of Her Majesty's Government, conclusive evidence that licence to cut and fell timber, without waste or injury, cannot safely be entrusted, except under very stringent rules, and even in that case without close supervision, to private individuals; and still less can such persons be relied on to take measures for perpetuating the forests, either by sowing or planting, or by leaving trees of the age and in the condition most likely to shed fructifying seed around them.

The measure which you have sanctioned, so far as I can judge from the proceedings to which I have alluded, originated in the representations of contractors obviously interested in the relaxation of the forest rules, who, not unnaturally, regard the former system to be a failure, and in whose opinion, as gathered from letters on your Political Consultations of February, 1861, the preservation of any forests by retaining them in the hands of Government is unnecessary and impolitic. On this point, the remarks of Dr. Brandis, in paragraph 64 of his Report for 1859-60, appear to me to be very just. It is natural that a department, whose duty it is to restrain individuals from cutting trees in the forests at pleasure, should be unpopular. But it should be taken into account that

although 'the general result of the first four years may have been in no way adequate to the toil and anxiety the work has entailed, yet many expensive lessons had to be learnt,' 'the real resources of the forests have not been indented upon,' and 'the forests have been preserved intact, and have been made, under the most unfavourable circumstances, to pay their own expenses.'

The credit here claimed seems to me to be fairly due; and as the results of all previous experience strengthen my conviction of the importance of a due conservancy of the forests, and of the impossibility of maintaining such a conservancy when the forests are in private hands, without stringent rules and great vigilance on the part of the department, I cannot but regret that the experiment of throwing open the forests should have been adopted on so extensive a scale.

I am, indeed, inclined to think that, if it were wise to grant leases of the forests to private persons, it would have been better to have granted them on leases for a long term of years, under more stringent rules in regard to the cutting of the timber and replacing it by planting and sowing, and with the power to resume every six, or perhaps ten years, if the conditions of the lease were not properly observed. Such a plan would probably have presented greater inducement to the capitalist to lay out money on the forest, and the risk to Government would not have been increased.

Notwithstanding these objections, as it appears that you are publicly pledged to the present measure, Her Majesty's Government do not desire that you should recall your sanction to it. Dr. Brandis justly observes that 'every system worked out with zeal and interest, must bear some good fruit,' and, in the present instance, I am far from wishing to deny that good results may be produced, if proper vigilance is exercised by the Forest Officers, and if some of the safeguards which have been abandoned can be restored.

With respect to the Western Forests, which are described as the least productive of any in Pegu, and, from the great extent of country over which they are scattered, the most difficult to preserve; their abandonment would, in the opinion of Her Majesty's Government, have been a far less objectionable measure, so long as the permission granted to the permit holders themselves to girdle the trees, and the reduction of the girth at which they may be girdled from six to five feet, be not suffered to form precedents for the Eastern Forests.

But, even in the Western Forests, one concession has been made which is in opposition to the instruction given at the suggestion of the Lords Commissioners of the Admiralty in my Despatch in the Revenue Department of the 12th of January, 1860, No. 2, I mean the abolition of the clause prohibiting the felling of timber, except close to the ground, and the cutting of long logs into short lengths. This rule must not be departed from in future, and should be restored, if possible, both in the Eastern and Western Forests.

Her Majesty's Government are decidedly of opinion that the whole of the Forests which you still retain, should be kept in the hands of Government, and they approve of your determination not to give up the three forests mentioned in paragraph 7 of your Resolution on the test proposed by Dr. Brandis.

I agree with your Excellency in Council that the cutting of undersized timber, and the girdling of trees in the forests east of the Irrawaddy, were not forbidden with sufficient clearness in the agreement submitted to you, and I trust that additional provision against these practices was inserted in compliance with your remarks to that effect, as well as one to ensure the addition of more places for checking the timber in transit.

Some stipulation should also have been imposed to provide for the renewal of the forests, such as the planting of five young trees in the room of every tree taken away, as was the rule, though unfortunately not strictly maintained in the Tenasserim Provinces.

I entirely approve of the rejection of the proposal to confine the competition for the forests to Europeans, to the exclusion of the Natives; and it is satisfactory to observe that it was strongly objected to by the merchants themselves.

On the practice of cultivation by *toungya*, I have already addressed you, in my Despatch in the Revenue Department of the 23rd of January last, No. 4, paragraphs 4 and 5, with a view to its ultimate prohibition. I will only here suggest, that where it is found necessary to allow the practice, the plan of Dr. Brandis might be adopted, and the sowing of teak seeds with the other crop might be made the condition of allowing it.

With reference also to paragraph 7 of Dr. Brandis' letter of the 25th of March, 1861, representing the difficulty of removing the most valuable timber of the forests, it would be well that you should consider whether it would not be

desirable to place in some of the forests still retained in the hands of Government one or two saw mills. Besides the actual work executed by these mills, the example might be followed by some of the private capitalists, arrangements in that case being made for the security of the Government revenue, which would have to be collected on the spot, or at fixed stations in the neighbourhood of the forests. If you should be of opinion that such implements could be advantageously employed by the Forest Department, you are at liberty to indent for saws of the kind best fitted for this purpose, to work two mills as an experiment."

The following summary of the Report of the working of the Forest Administration in Burma for the year 1864-5 appears a fitting termination to the history of the Burma Forests from 1827 to 1864, since it shows the results which were certain to follow the introduction of proper forest conservancy into the Province. The summary was sent by the Government of India to the Secretary of State.

"It will be seen that the timber trade of the Province is flourishing and the revenue realised continues to increase, although the outturn of teak has been less both from the forests worked by Government agency and from those held by permit holders. The financial results of the year are :

	Rupees.
Results	9,36,233
Expenditure	2,63,239
Surplus	Rs.6,72,994

or, deducting the difference of stock and outstanding balance, there is a net surplus of Rs.5,23,903. The duty on foreign timber amounted to Rs.2,83,207.

The importation of foreign teak amounted to 102,655 logs and 29,019 converted timbers, being an increase over the previous year of 8000 logs and 24,000 converted timbers. By the Salween River alone 89,000 logs were floated down from the Siamese territories.

Forest reserves have been formed to the extent of 40,000 acres. Within these tracts the destructive practice of tounya cultivation is strictly forbidden, and various measures are taken for the improvement of the teak. It is proposed to demarcate other selected forests from year to year.

Considering the great demand for Burmese teak, the

systematic culture of the tree is a point of the first importance, and we consider it advisable gradually to form plantations in suitable sites on the banks of the navigable rivers where teak formerly existed. In the details of management, the Conservator will avail himself of the experience gained in Malabar, where the plantations have been planned and executed in a most judicious manner. There is reason to believe that the Karen inhabitants will enter readily into this new industry.

A great improvement has taken place in the management of the Government timber station at Kaddoe, on the Salween. The value of drift timber is considerable. The drift timber of the year amounted to about 7778 teak logs. A large portion of these waif logs were formerly lost.

Successful results have followed the blasting of rocks, to remove obstructions in various hill streams, and these operations will be continued in other localities which will also facilitate the transport of general merchandise.

Consequent upon the opinions of the Government dockyard officers, and private shipbuilders at home on the question of seasoning timber by girdling, it seems expedient to reduce the time between girdling and felling from three years to two, and a further modification of the girdling rules may become advisable.

Adverting to paragraph 5 of Sir C. Wood's Despatch, No. 1, of 1865, we have the honour to report that one division of the forests of the Upper Salween has been leased to Karens of influence for six years, as was strongly advocated by Dr. Brandis, and approved in the above Despatch."

CHAPTER XXI

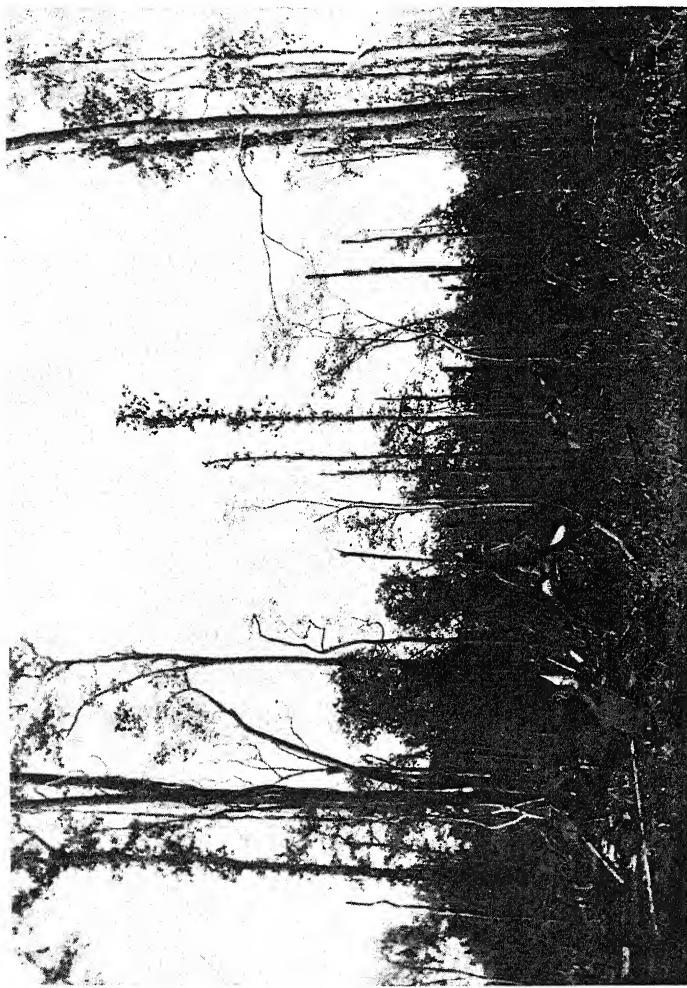
THE COMMENCEMENT OF FOREST ADMINISTRATION IN THE CENTRAL PROVINCES, 1858-1864

THE fact that the great mass of forest-covered hills occupying Central India was unknown to British officials in 1860, as also to the surrounding Indian dwellers in the plains, has been already alluded to. The best maps at that time showed great tracts in this region as "unexplored."

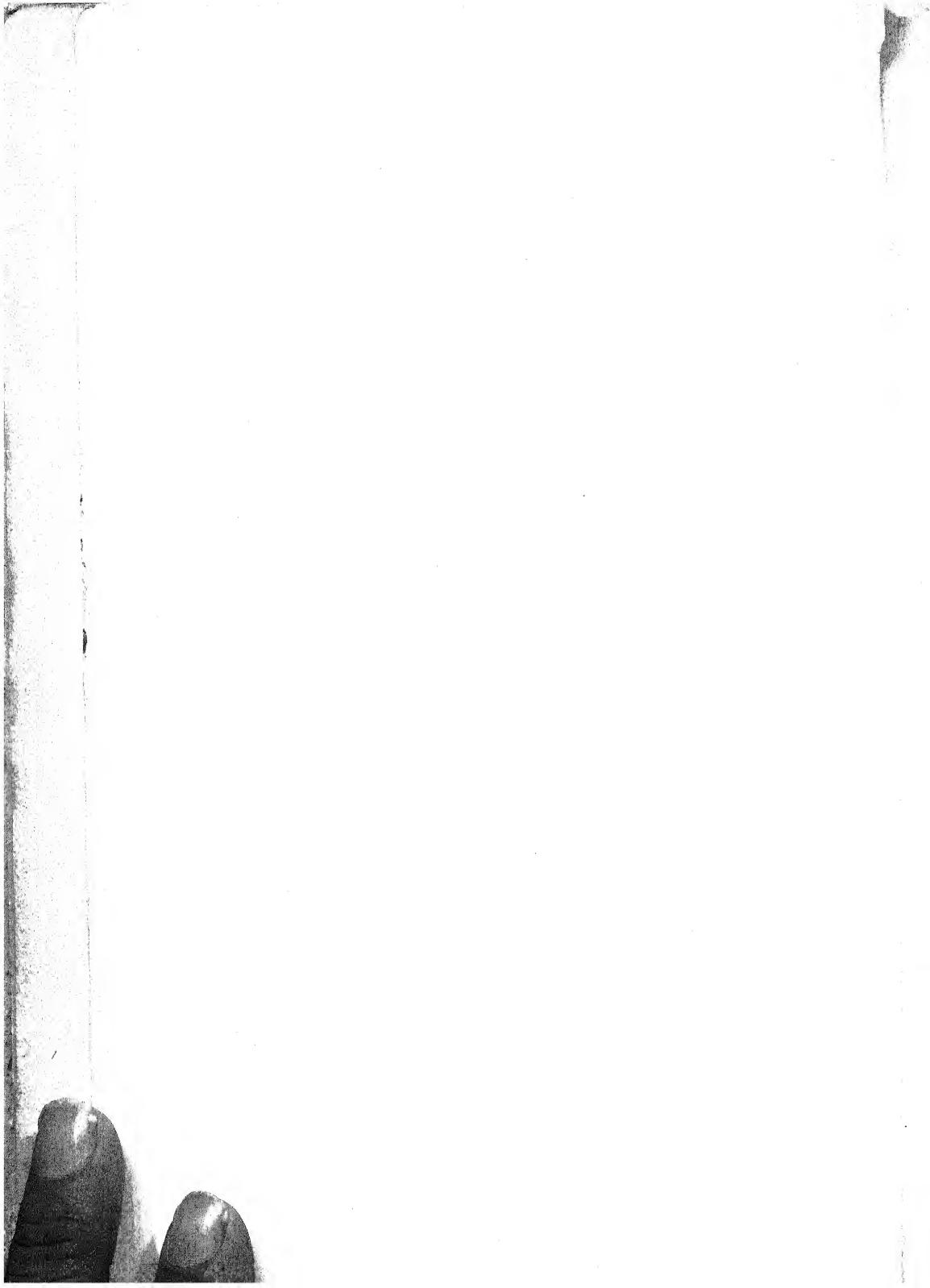
The aftermath of the Mutiny brought about a change. After a rebellion which threatened to upset British rule for a considerable period the rulers of India woke up and a new order of administration had its birth. In company with more important Provinces this secluded central region of the country felt the benefit of the impulse given to the administration of the Empire generally. A railway was to be driven through the heart of its valleys, and its black cotton soil was marked down as a valuable future field for the growth of cotton. With a central Administration a great future lay before this region.

In 1861 the ideas of Government found expression in the constitution of the Central Provinces as a Chief Commissionership. Mr. (afterwards Sir Richard) Temple was appointed the first Chief Commissioner. Mr. Temple was a man of great energy and high administrative ability. During his incumbency he rode through and explored almost every part of his great and, till then, almost unknown charge. The wild aborigines of the forests who had rarely seen a Sahib before soon became acquainted with the familiar figure of the Chief and his party. A better man, it was said, to administer a totally undeveloped Province, as it then was, could not have been chosen.

The Chief Commissioner was not long in perceiving that the highland centre of the Province, with its extensive forests and mineral wealth, its limitless tracts of unclaimed waste and



SÁL FOREST HEAVILY CUT OUT BY CONTRACTOR AND THEN SWEEPED BY A STORM.
A GOOD EXAMPLE OF THE AFTER EFFECTS OF LUMBERING



scanty semi-wild population, and its great capabilities for the storage of water, was worthy of his careful attention. Mr. Temple had already displayed his interest in the forests of the country, and a recognition of their importance to the welfare of the community generally during his service in the Punjab. He quickly gave evidence of this interest in the action he took in the Central Provinces.

It was being said by some that the forests of this region, to which the prospectors of the railway lines, then being constructed through the Province, looked for their supply of timber, were likely to prove a broken reed ; the forests having been already exhausted by a long course of mismanagement ; but this statement had yet to be proved.

One of the first steps taken by Temple was to organise a Forest Department for the detailed examination and conservation of the timber-bearing tracts. To the charge of this Department, as Superintendent of Forests, he appointed Captain (afterwards Colonel) G. F. Pearson. Captain Pearson was an officer who, in the words of an official in the Province at that time, "had travelled extensively in these regions in quest of sport, and who was admirably fitted for the task by physical qualities, and the possession of that faculty of observation which is not to be attained by the labours of the study."

In his "Recollections of the Early Days of the Indian Forest Department, 1858-64" (*Indian Forester*, Vol. XXIX), Colonel G. F. Pearson gives a valuable insight into the administrative work carried out in the Central Provinces during this period. In 1858, when the embers of the Mutiny were still smouldering in the country, Captain Pearson was at Seoni, in command of a regiment of Military Police consisting of one squadron of cavalry, four companies of native infantry (600 men in all) with three British officers. In September of that year Tantia Topee undertook his celebrated raid into the Deccan, halting for three days with 3000 cavalry sixteen miles from Seoni. Captain Pearson's force had an anxious time during this halt, but they were not attacked, Tantia Topee retiring across the Nerbuda. Pearson says that his principal duty while in command of this force was to patrol the country and rout out any mutineers and disaffected natives who were hiding in the hills or forests ; and that it was while employed in this way that his attention was first directed to forest conservancy. He did not add the fact, which was well known, that he was an ardent and first-class sportsman,

and that he had become acquainted with the forests and learnt to love the life spent in them during many sporting expeditions. It was owing to the existence in the country of this type of men, amongst whom may be mentioned Colonel Doveton, Colonel F. Bailey, Colonel Peyton, and in the south Major-General Michael, C.I.E., Major-General Cotton, C.I.E., and Colonel Beddome, that the introduction of forest administration and conservancy was carried out with such success. They were untrained in scientific forestry, but they loved the forests and did most magnificent work in their day.

Dealing with the position of the forests after the suppression of the Mutiny and the manner in which they were thrown open to timber contractors who were given *carte blanche* to fell when and to what extent they liked, upon which Forsyth also commented, Pearson brings out an interesting point in this connection. He says that it was only necessary for a contractor, whether European or native, to obtain a parwana or order from the Civil Authorities to cut timber and then he started work, and as every Gond carried an axe the forests were soon filled with fallen logs. He adds: "I continually brought this to notice in my reports, my having done so no doubt paved the way to the formation of a department whose duty would be the preservation of the forests from ruin. It may be of interest to mention that the granting of these parwanas was not without its after-use, as when the rights of Government to the forests and timber in them were questioned, they helped to prove a claim." He also states that the term "Conservator of Forests" was deliberately adopted at the time by Government, as indicating more strictly the first duty of the Forest Department. Then, as for many years later, there was, he says, "a disposition in some quarters, to insist on its being a revenue-producing department, an idea which, if carried out, would necessarily end in forest destruction."

As, in fact, had been the case during the first sixty years of our interest in the forests of India.

In the spring of 1859, under instructions from Mr. A. Cox, the Commissioner of Jubbulpore, Pearson made a thorough inspection of the forests of the Mandla Plateau and of those along the Meykeel Range as far as Bundhara. "Starting from Mandla in March I marched," he says, "through the Khor-meyr country, which forms the upper basin of Nerbudda, to Amar Kantak, from near which place that river takes its rise,

To this point the Satpura and Meykeel Ranges converge, forming the two great plateaux of Amar Kantak and Goura Dadur at an elevation of 3500 feet above sea-level, and I have a vivid recollection of the grand view obtained from them, standing out as they do like great headlands into the plains of Chattisghar and Paindra, fully 2000 feet below them." From Amar Kantak Pearson turned back to the south-west, following the ranges for nearly 200 miles, exploring the forests and noting their contents. He observed that while the mature teak in the Botmeyr and Khormeyr Valley was nearly all destroyed and burnt in the same way as in Seoni, the sâl forests on the upper plateaux and on the Kunjar River were practically untouched. He mentions that there was splendid shooting in this country, the deer and buffalo who roamed the country having "probably never heard the crack of a rifle." What a change in this respect half a century was to bring about!

In August, 1860, Pearson was appointed the first Conservator of Forests in the Saugor and Nerbuda territories, and had two assistants allocated to him. He selected Lieutenant Forsyth (26th Punjabis) and Lieutenant (afterwards Major) Douglas of his own regiment (33rd M.I.) to fill these posts. They both turned out excellent men for the work. Of Forsyth he wrote as "one of the ablest men I ever had under me; indeed, so able a man was he that four years later he was singled out by Sir R. Temple, and appointed Deputy Commissioner and Settlement Officer of Nimar. His settlement report of that district was, I believe, considered second only in importance and ability to that of Sir Charles Elliott for Betul and Hoshangabad."

After some years in the Central Provinces Douglas was transferred to Burma. He never liked the Burma work after that of the Central Provinces and it affected his health. He was re-transferred to the Punjab, but only to die before being made a Conservator.

The first work facing Pearson and his assistants was to collect in depôts at Jubbulpore and Mandla as many of the half-burnt logs strewn throughout the forests as possible. Many thousands were thus collected, and the proceeds from the sales thereof "furnished the funds of our first modest little budget for 1861-2."

In 1861 when the Central Provinces were constituted a Chief Commissionership under Sir R. Temple, the southern part of

the Province was added to the Conservator's charge, and in 1862 the forests of the Berars (the Hyderabad Assigned District) with the valuable Melghat Forest were included.

The whole of the next five years were spent in exploring and examining the contents of the forests. Pearson says that each year he marched over 2000 miles, "besides doing the forest work." "The life was a very rough one in those days of early Forest work," he says, "as communications were entirely absent. Still, there were compensations. We had less office work to do, a number of Government elephants at our disposal and a good supply of tigers and other game in the forests." Pearson twice visited Pachmarhi, where Forsyth was building the Forest Lodge, and negotiated the lease of the plateau to the British Government with the Thakoor. He says he was ably assisted in the work by Forsyth (as the latter's book, *The Highlands of Central India*, well shows) and Douglas; the latter examined and reported on the teak and sâl forests in Mandla, whilst Pearson himself worked in the Boree and Betul Forests.

The Conservator states that at this time "the jungles of Betul and Hoshangabad were literally swarming with tigers, and I soon got in touch with them while doing my work. I once came across four full-grown tigers lying in the shade of a rock by a pool on the Machna River. I was liberally supplied with Commissariat elephants and besides had my own excellent shooting elephant, so that I never had any difficulty in following tigers." And from some of the stories Pearson tells he might have added in killing them. They were palmy days for the keen sportsman, these early days of the young Department in the Central Provinces—gone, alas, never to return!

Early in 1863 Brandis was appointed the first Inspector-General of Forests in India, and shortly afterwards summoned Pearson to meet him in Nagpur. They marched together to Allicutta on the Pench River, and from there through the teak and mixed forests at the foot of the Korai Ghal Range as far as the Wynganga, and then for a short tour in Mandla. "I remember," says Pearson, "that he was greatly pleased at my being able to go through the forests without a guide, but I should not have been able to cover a quarter of the ground that, since my appointment to the Department, I had explored, nor should I have been able to acquire the knowledge of the forests and their contents, as well as of the tribes that inhabit

them, which I possessed, had I not early learned to do so. It is a habit which every Forest Officer should cultivate."

During these marches Brandis and Pearson discussed, in a preliminary manner, the main points of the forest policy to be inaugurated, the policy then laid down, serving as a basis for the future working of the Department. These points were :

- (1) Demarcation of reserves.
- (2) The protection of forests from fire.
- (3) Sources from which a forest revenue might be raised.

It was then decided to select two blocks of forests in which practical experiments in protection from fire should be carried out. After mature consideration Pearson selected, with Brandis' full concurrence, one block in the Boree Forest at the foot of the Puchmuree Hills, and the second block in the Jugmundel Forest of the Kormeyr Plateau of the Mandla Hills.

From Mandla Brandis and Pearson visited the Beejara-goghur sâl forests on the Rewah Frontier, where Lieutenant Douglas was arranging for a supply of sleepers for the railway in course of construction from Allahabad to Jubbulpur. The Conservator says : " I recollect that on our arrival in Douglas' camp we found waiting for us an excellent breakfast, carefully laid out by his Madras servant on a white tablecloth with real bread and butter—a luxury we had not had for some time. Brandis was much pleased at this, and remarked to me that Douglas would make a good forest officer, ' for he pays attention to details.' "

The Inspector-General left Pearson here, and the latter returned to spend the hot weather in the Boree Forest in order to start the fire-protection schemes.

The description of this work does not fall into the period here under review.

Whilst the Forest Officers of the then small Department were engaged in the arduous duty of exploring and examining the contents of some 36,000 square miles, comprising the hill tracts region, besides examining so far as possible an almost equal extent of low-lying forests in the south, a land settlement was also in progress.

The highland region was divided into eleven of the nineteen districts into which the Province was subdivided. The total area of these districts was 44,000 square miles, of which about 11,000 were under cultivation and the remainder waste. It

was estimated by the settlement officers at the time that this enormous waste area of about 20,000 square miles was useless for tillage, the remaining 13,000 being probably more or less capable of improvement. It has since been found that a larger area than the above was capable of being cultivated.

The greater part of this land had been subject to the land tax. During the times of anarchy which preceded the British rule, the assessment had been, in practice, only levied by force by whichever band of robbers happened to be in the ascendant in a locality at the time. The rights of property had therefore fallen greatly into abeyance, no one wishing to claim the land and thus be subject to spoliation. Our rule soon changed this aspect of affairs ; land property acquired a value again, and numerous claimants appeared on all sides. This land settlement was far from completion, however, at the end of the period here dealt with.

The inhabitants of the hilly forest tracts consisted of aborigines known as Gonds, Kols, Korkus, Bygas and Bheels.

Allusion has already been made to the fact that at the time the Central Provinces were constituted little was accurately known regarding the forest resources of these vast waste regions. It had, indeed, been hinted that there was a possibility that the projectors of the railways had over-calculated the possible supply ; but it was not appreciated that the exhaustion of the forests had gone so far as really proved to be the case. The devastation was mainly attributable, as in other parts of India and Burma, to the pernicious system of cultivation practised by the hill tribes, and, in fact, by all the un-reclaimed aboriginal races throughout India. The system was that form of shifting cultivation termed *kumere* in Madras, *toungya* in Burma and here "dhya" and "jhuming" in Bengal. The forests of this Central Region had for centuries been devastated by the cutting and burning of the best timber to form ashes to manure their wretched fields of half wild grain, the chief grains used being Kodon (*Paspalum*), Kutki (*Panicum*) and coarse rice, though other plains crops of the autumn season, usually from degenerate seed, were also sown.

Forsyth, in his sporting classic, *The Highlands of Central India*, describes the method in force in Central India in the following interesting paragraph :

" Though large tracts of splendid level land lie untilled on the Puchmari Plateau, and in the valleys below, the Korku has no cattle or ploughs with which to break it up. He has

nothing in the way of implements but his axe. This is enough, however, for his wants. He selects a hill-side where there is a little soil, and a plentiful growth of grass, timber and bamboos. He prefers a place where young straight teak poles grow thick and strong, as they are easiest to cut, and produce most ashes when burnt. He cuts every stick that stands on the selected plot, except the largest trunks, which he lops of their branches and girdles so that they may shortly die. This he does in the dry season (January to March), and leaves the timber thickly piled on the ground to dry in the torrid sun of the hot season. By the end of May it will be just like tinder, and he then sets fire to it and burns it as nearly as he can to ashes. With all his labour, however (and he works hard at this spasmodic sort of toil), he will not be able to work all the logs into position to get burnt ; and at the end of a week he will rest from his labour, and contemplate with satisfaction the three or four acres of valuable teak forest he has reduced to a heap of ashes, strewn with the charred remains of the larger timber and trunks. He now rakes his ashes evenly over the field and waits for rain, which in due season generally comes. He then takes a few handfuls of one of the coarse grains he subsists on and flings them into the ashes, broad cast if the ground be tolerably level, if steep, then in a line at the top, so as to be washed down by the rain. . . . Such is the fertilising power of the ashes that the crop is generally a very productive one, though the individual grains are far smaller than the same species as cultivated in the plains. A fence against wild animals is made round the clearing by cutting trees so as to fall over and interlace with each other, the whole being strongly bound with split bamboos and thorny bushes. The second year the dead trees and half-burnt branches are again ignited, and fresh wood is cut and brought from the adjoining jungle, and the same process is repeated. The third year the clearing is usually abandoned."

These clearings, in all the parts of the country where this system of cultivation was in force, were the favourite resort for all the wild animals of the neighbourhood, the larger being shot and the smaller, peafowl, partridges, hares, etc., being trapped in various forms of "dead fall" traps set in runs left open for the purpose. Sometimes the owner of the clearing sat up on a "machan," or platform, in the middle of the field, and endeavoured to frighten off the wild animals, but more usually he did not think it worth the trouble and

left the crop to take its chance till ripe for cutting. At the period few of the villages of the aborigines were, however, without their professional hunter or *shikari*, who was usually a good shot with his long, heavy matchlock, and his patience was unwearying in sitting up watching for game. He took it in turn to sit up at night in the *dhya* clearings of the village, getting as remuneration all that he killed—and he spared nothing, neither sex nor young animals—and a basket of grain at harvest time besides. The skins of the sambhar deer have always had a considerable value in the market for preparing the well-known soft yellow leather which makes the best of sporting boots and gaiters, etc.

This system of cultivation, if it can be called by that name, was of the most precarious nature. The holding off of rain for a few weeks after the seed was sown, or when the ear was forming, meant the ruin of the crop, and then the owner was usually compelled to subsist entirely on what always largely supplemented his diet—the wild fruits and nourishing roots, with which fortunately for him the Indian Forests are well furnished. The rare seeding of the bamboo was a godsend to these people.

Forsyth's description of what followed in the train of the *dhya* clearing is of considerable interest, since the history of the forests of this region is so intimately connected with the nomadic life and methods of existence of the aboriginal tribes who had for so long inhabited the area.

"The abandoned *dhya* clearings are speedily covered again with jungle. The second growth is, however, very different from the virgin forest destroyed by the first clearing; being composed of low and very densely-growing bamboo, and of certain thorny bushes, which together form in a year or two a cover almost impenetrable to man or beast. I have often been obliged to turn back from such a jungle after vainly endeavouring to force through it a powerful elephant accustomed to work his way through difficult cover. In such a thicket no timber tree can ever force its way into daylight; and a second growth of timber on such land can never be expected if left to Nature. The scrub itself does not furnish fuel enough for a sufficient coating of ashes to please the *dhya* cutter; and so the latter never again returns to an old clearing while untouched forest land is to be had. Now if it be considered that for untold ages the aboriginal inhabitants have been devastating the forests, the cause of the problem that has



OLD UNCUT SÁL FORESTS IN CHOTA NAGPUR. A CHARACTERISTIC VIEW. A CONTRACTOR'S
FAIR-WEATHER BRIDGE OF SLABS ACROSS A NULLA.



puzzled railway engineers—namely, why, in a country with so vast an expanse of forest-covered land, they should yet have to send to England, or Australia, or Norway for their sleepers—will not be far to seek. Stand on any hill-top on the Pachmarhi or other high range, and look over the valleys below you. The dhya clearings can be easily distinguished from tree-jungle; and you will see that for one acre left of the latter, thousands have been levelled by the axe of the Gond or Korku. In fact, I can say, from an experience reaching over every teak tract in these hills, that, excepting a few preserved by private proprietors, no teak forest ever escaped this treatment, unless so situated in ravines or on precipitous hill-sides as to make it unprofitable to make dhya clearings on its site."

As a natural consequence of this method of cultivation, the people led a wandering nomadic life. They lived in small hamlets, of a few families only in each, scattered at such intervals as would give each settlement a sufficient range of jungle for dhya cutting. The huts were of the most temporary character made of materials from the forest. A few upright posts interlaced with bamboos, plastered with mud and thatched with the broad leaves of the teak with an upper-layer of grass or with grass only. To shift such a settlement entailed but a day or two of work, when the change of dhya sites made a move a necessity. As far as the men were concerned their idea of a pleasant existence was to accomplish the minimum amount of work possible in the shortest period of time, and thus spend the rest of their days in hunting and roaming about in the forests; and this outlook upon life persisted to a much later date, in fact exists in the wilder parts of the country to this date, as many a Forest Officer has discovered for himself.

The dhya cultivation practised throughout the hills of the Central Region was almost in itself sufficient to have proved the ruin of the forests, but other causes had also unfortunately supervened. The most valuable timbers for railway construction and other purposes at the time were the teak and the sâl. No other timbers were considered to be really lasting when subjected to the great and sudden variations of the Indian climate. In this matter the conservatism of the native was hide-bound to a degree: and the British assimilated these opinions without question. Throughout the great Indian Forests, comprising a number of fine useful timbers, many of which should have had a high marketable value, but a few

species were in common use, and against these a merciless war of extermination was waged, no efforts being made to ascertain the value of the rest or their capabilities of replacing for many purposes the few which custom through long ages had come to consider as the only commercial and utilisable timbers. These opinions were to remain in the ascendant for long years after the period here dealt with. Forsyth himself appears to have become, unconsciously perhaps, infected in some slight degree with the prevalent opinions. To some extent his remarks account for the extraordinary rapidity with which a great part of the Bombay, Madras and Tenasserim Forests were cut out during the first half of the century. On this subject Forsyth wrote :

"The teak tree is perhaps the most generally useful in the whole world. In combined strength, lightness, elasticity and endurance there is none to compare with it. At the present day its uses cover a wider range than those of any other timber, from the handle of an axe in its native forests to the backing of an ironclad in the Navy of England. But it is unfortunate also that it is the easiest of all timbers to fell, and makes better firewood and charcoal than any other. It is little wonder then that on it almost exclusively, when found, had fallen the weight of the peoples' requirements, ever since the country was populated by civilised tribes. I have already said that it is a most difficult tree to reproduce, the seeds being exposed to the extremities of danger before they have had the opportunity to germinate. The seedlings also, with their great dried leaves, like so many sheets of tinder, are more exposed to injury by fire than those of any other tree. Thus the teak had been everywhere mercilessly cut down, and had to struggle with the most adverse circumstances to maintain a footing at all. Over great tracts where it once grew it has been utterly exterminated, giving place to such worthless species as the *Boswellia*, which no one would dream of cutting, and on which Nature has bestowed all the indestructible vitality of a weed. The teak has but one rare and valuable property, by means of which it has alone continued to survive at all in many places. However much it may be cut and hacked, if the root only be left, it will continue to throw up a second growth of shoots, which grow in the course of a few years into the size of large poles. This is the sort of timber which was chiefly in demand for the small native houses before the introduction of our great public works ;

and thus may perhaps be explained the apathy with which the Native Governments witnessed the destruction of the forests of larger timber."

Contrasting the sâl with the teak, Forsyth commented upon the much greater vitality of the sâl as a species, and added that it was not so generally useful, particularly for minor purposes, "being hard to fell, of coarse grain and making an inferior charcoal." Owing to the valuable commercial "dammar" the tree produced, he stated that this fact alone had led to a very great destruction of the sâl forests; whilst thousands of square miles of forests of this species had been destroyed by the Bygar in dhya cultivation. At this period the sâl forests of this region were very inaccessible, Forsyth writing: "The sâl tracts are very inaccessible from the populous regions, the nearest point where any great supply could be had, for the railway being about 100 miles, by a bad land route. This distance has up to the present time proved an unsurmountable obstacle to the general utilisation of the sâl timber on the railway works . . . the railways finding it cheaper to import pine sleepers from Norway, and ironwood from Australia than to carry the sâl timber growing within a hundred miles of their line."

The Annual Report of the Forest Department for 1863-4, submitted by Captain Pearson, gives evidence that a certain amount of progress had been made in the proposed conservancy measures. Rules for the management of the forests had been drafted and were under consideration by the Government; recognition had been obtained to the necessity of prohibiting dhya cultivation in valuable forest areas; and the subdivision of the forests into separate forest charges had been suggested by the Conservator. The full introduction of these measures only came into force after the close of the period under review.

The financial results for the year 1863-4 were as follows: The actual receipts amounted to Rs.70,988 and the expenditure to Rs.67,707, showing a surplus of Rs.3281. The outstandings amounted to Rs.7000, and the balance of stock on the 30th April, 1864, was valued at Rs.78,766 against Rs.20,000 on 30th April, 1863.

Both the Governor-General and the Secretary of State commented very favourably on the good commencement made with forest conservancy in the Province, and "on the interest shown by Mr. Temple and the zeal and ability displayed by Captain Pearson, the Conservator."

CHAPTER XXII

FOREST OPERATIONS IN THE PUNJAB, 1858-1864

THE WESTERN HIMALAYAN FORESTS

THE energy with which railway construction was being pushed on in Upper India resulted in a very heavy demand for railway sleepers. With a view to ascertaining the extent to which the forests of the Western Himalaya could supply a portion of this demand, Cleghorn was directed by the Governor-General in Council in November, 1861, to proceed from Madras to the Punjab, where he was given instructions by the Lieutenant-Governor to make an investigation of the Western Himalayan Forests. It was desired to obtain reliable information regarding the timber resources of that Province, and to inaugurate a systematic plan of conservancy and management.

Wallich, Royle, and others had, earlier in the century, visited and reported on the general aspects of the forests of the Terai, at the base of the Cis-Sutlej Himalaya, in Oudh, Rohilkand, and Dehra Dun; but the only published accounts of the Trans-Sutlej Forests were at this time to be found in the occasional allusions of Cunningham (*Notes, Jour. As. Soc. B.*, 1844), Thomson (*Travels*, 1852), Madden (1845), Moorcraft, Edgeworth and Jacquemont (*Voyage dans l'Inde*, 1844). These, though of high interest, did not furnish any approximate data as to the area of forests, kinds of timber available, or means of transport, matters which it had now become a vital necessity to have correct information upon. As has been detailed in a previous chapter, Major Longden made an inspection of some of the forests of the region in 1851-3; but a survey in far greater detail was now contemplated. Dr. Jamesen, Superintendent of the Botanical Gardens, Sahanpur, had published in the Agricultural and Horticultural Society of India (1854) an account of the physical aspects of the Punjab, its agriculture and botany, but this did not relate

to the hill forests. It was this survey of the forests which Cleghorn now carried out, and the Report, dated Rurki, 28th October, 1864, giving an account of his work and investigations, is one of the most remarkable pieces of investigation on the forests extant for this period, and probably could have been written by no other man serving in India at the time.

The exploration of the forests on the different rivers (the Giri, Pabur, Tons, Sutlej, Beas, Ravi, Chenab and Jhelum) and their tributaries from east to west, from the Jumna to the Khyber Pass, occupied the summer months of 1862 and 1863 ; while the winter months were devoted to the inspection of timber depôts and brushwood tracts in the plains, and the preliminary arrangements necessary for the formation of a Forest Department in the Punjab. The Report contains two valuable Memoranda dealing with the fuel supplies of Simla and the other Punjab hill-stations, and with that of the plains of the Province.

It will thus become apparent that Cleghorn was responsible for the inauguration of the Forest Departments in two distinct centres in India—in the Presidency of Madras, of which he was the first Conservator, and in the Province of the Punjab, in which latter work he was associated with Brandis.

Lord Dalhousie, as already related, had appointed Captain Longden to explore the Forests of Bushahr and Chamba in 1851. Cleghorn found that since Longden's visit and Report the forests of the Western Himalaya had been subjected to greatly increased demands in connection with the progress of railway enterprise, and of advancing civilisation. During his tours he found "the rudest system of converting and launching logs in the rivers prevailed, and that the enhanced value of timber had led to an indiscriminate felling of the finest trees, threatening speedily to exhaust the deodar forests, and to deprive the State of those supplies which are essential to the construction of public works. The demand is certain to continue, while the sources of supply are limited, and the physical difficulties of transport from the Himalayan Forests being very great, systematic and skilled management are imperatively called for."

In his Report Cleghorn describes the forests containing the most valuable timber, enumerates all the economic plants observed during his journeys, and records the various district rules and tenures affecting the introduction of Forest Conservancy. Sketch maps indicating the approximate position of the

deodar forests are given in the Report. "It will be observed," he writes, in the latter connection, "how small is the area within British territory yielding this valuable timber, compared with the tracts of leased forest in Chamba, Bushahr and Garhwal (Tehri). He also shows the courses of the rivers, canals, and railways on the maps and the chief wood depôts then existing at Rupar, Madhopur, Sealkote, Jhelum and Hushtnugur. Lists of useful trees and shrubs found in the valleys of the different rivers, with their vernacular names, are included, a most valuable addition at the time the Report was written.

THE VALLEYS OF THE GIRI, PABUR AND TONS RIVERS

Cleghorn left Simla on 31st March, 1862, accompanied by Captain Houchen, Superintendent of Hill Roads, on his first tour to explore the valleys of the Giri, Pabur and Tons rivers, tributaries of the Jumna. They proceeded via Fagu, so well known to all Simla residents, up the Giri Valley to Kotkai, "where there was a great consumption of wood and charcoal in connection with the iron smelting, for which that locality is famous. On our way we passed in two days fifty mules and nearly a hundred coolies laden with iron (a mule carries $2\frac{1}{2}$ maunds (1 maund = 80 lb.) and a coolie 40 lb.) proceeding via Simla to the plains." Deodar was scarce in this part of the district, but there were eight small forests of *Pinus longifolia* (chir) and *Pinus excelsa* (blue pine) on Government land, and a clump of *Cupressus torulosa*. The neighbourhood was formerly far more wooded, the iron works having resulted in a considerable destruction of the forests. The forest revenue, Cleghorn records, was almost nil, where the destruction of wood was great, and the preparation of the charcoal, in open pits of the most primitive nature, was attended by much waste. The total amount of iron exported annually from Kotkai and Shil amounted to 2000 maunds. The description given of the method of making charcoal at that time is interesting. *P. excelsa* and some alder, *Alnus nepalensis*, were the chief species used. "Pits are dug about 6 feet in diameter at the top and 3 at the bottom; these are filled with fresh pine wood, heaped up to 3 feet above the level of the ground. Fire is applied when the first layer of wood is put in, and continues to burn while the rest is being added. A few spades-full of loose soil are thrown upon the top after the pile has been blazing for

some time ; thus a very large proportion of the wood is consumed without being charred, and the charcoal produced is inferior."

The practice of the villagers, which could be seen comparatively recently in the neighbourhood of Simla, of trimming the young pine trees to an injurious extent, to provide litter for their cattle, often leaving nothing but the leading shoot with a tuft of needles at the top, is also noticed. " We strictly enjoined the people not to head-lop or otherwise mutilate the trees," says Cleghorn ; but little attention was paid to this injunction.

They found no large forest on the Giri, nor did they learn that any deodar or other timber had ever been floated down it ; and the district officers had never heard of any forests of this species. Crossing over to the Pabur they found iron smelting carried on at Shil where it had long been practised. The tools used in making the Hindustan-Tibet road, an enterprise projected by Lord Dalhousie, as already described, were made here. The deodar forest cut down by Captain Briggs in 1854 (p. 271) contained now many promising young trees, and Cleghorn advised its protection by the local authorities. He also recommended that charcoal-makers should only cut in spots assigned to them in Government forests, a small payment being levied for the privilege, as was the custom of the Hill Chiefs. All the existing wood, he said, would be required for the successful working of the iron mines.

Cleghorn descended to the Pabur near Ruru, and proceeded up the stream to some miles above Shergaon. He was of opinion that the river would require a considerable amount of blasting before it could be rendered suitable for floating timber down. From Raeenghur to Shergaon the valley is wide and few forests existed, chiefly situated on the Changsil Range, 2500 to 3000 feet above the river bed. Between Ruru and Shergaon an extensive forest was seen, consisting of Spruce, Blue Pine (*P. excelsa*), with small clumps of Deodar and Oak, situated three to four miles from the river, and a considerable deodar forest of moderate-sized trees the same distance from the Pej stream, the latter here difficult for floating. In 1861, Mr. E. L. Brandreth, Commissioner, Umbala Division, had marched from the source of the Pabur to Raeenghur and saw no deodar. At a lower part of its course there was, however, a fine *Pinus longifolia* forest, extending more or less for several miles above its junction with the Tons, where the

river was encumbered with boulders. As is common in this part of the Himalaya, elms, horse-chestnuts, walnuts and mulberries occurred near the villages, many of the trees being mutilated from having the young branches periodically cut off to be stored as winter fodder for cattle. *Pistacia integerima*, many trees of a size to produce planks 6 to 8 feet by 2 to 2½ feet, was frequent on the banks below Raeenghur, as also the alder, growing into very large and fine straight trees.

The Tons (tumasa or dark), so called from its being skirted in the upper part with gloomy forests, is larger than the Pabur (i.e. clear) River. They unite at Tuni where there was a rope bridge (jhula), and fall into the Jumna in the Dun, a little above the confluence with the Giri. The Tons is a rapid river, but the boulders in the bed are not large, and Cleghorn was of opinion that timber could be floated down it in the rains, if cut into sleeper lengths; a work which, as will be subsequently shown, has since been carried out. He saw numbers of stranded logs out of the 5000 said to have been sent down the river during last season's working. The banks up the river from Onowli (five miles above Tuni) towards Kedarkanta Mountain (12,680 feet) were densely wooded. Above the junction of the parent streams, Rupin and Supin, the river was unfit for floating purposes. Cleghorn followed the Mussoorie road down to Bandrowli, where the Tons River turns south-west, but did not go lower, as the deodar forests ended here, and the flora changed to that characteristic of the outer Himalaya. In the hot valley for some miles above Tuni there was a forest of tall, straight *Pinus longifolia*, and on the higher slopes above the villages of Mandrat and Onowli were forests of blue pine, spruce and deodar, the latter seen crowning the highest ridges. At Naintwar, the junction of the Rupin and Supin, it came down to the river bank, and trees had been felled here recently, the logs being much injured by being hurled over precipices. There was also a large quantity of deodar near Bastil within a radius of six miles of Tuni, but it was not easily accessible to the river; sissoo in considerable quantities and tun (*Cedrela toona*), less abundant, was found on the river banks. Olive existed and was much prized, as it was used for making the "tangili" used by the men who prepared the rope bridges.

Summing up the facilities for transport on these rivers Cleghorn says, "The affluents of the Jumna are considered to be more rapid in their course than those of the Western

Himalayan rivers, and consequently they afford less facility for timber transport than the tributaries of the Chenab, the Jhelum, or the Indus. It is certain that rafts are impracticable on any of these three rivers. However, I believe that under good management, single logs cut to sleeper lengths may be taken down the Tons from Garhwal (Tehri). The experiment of working the forests of this Province was tried many years ago by Major Young, Superintendent, Dehra Dun ; the timber is said to have been much damaged, but the scantling being required for architectural purposes was too long for transport in a river bed interrupted with rocks. Lately, private enterprise has occupied the field ; two European contractors have been at work on the Tons, and are said to have launched several thousand logs last year, with what success is unknown to me. Deodar wood exists in large quantity in Garhwal, and a variety of other useful timbers.

Wood-cutters are procurable in the valley of the Tons for 5 rupees per mensem, and mates for eight. The conservancy of these forests rests with the Authorities of Garhwal and Dehra Dun (N.W. Provinces), and in each of these districts a forest officer is located (in 1864). The Pabur and Giri flow through Bushahr and Sirmur (Native States) respectively, the supply of deodar being scanty in the upper valleys, and the volume of water too small for floating logs."

In view of the work carried out later on by the Forest Department in this region, this Report was a remarkable forecast of the possibilities of exploiting the forests in these difficult mountains.

THE VALLEY OF THE SUTLEJ RIVER

The Sutlej Valley was the next one explored by Cleghorn. In 1861 the Punjab Railway Company had deputed Mr. Strong to examine and report on the forests of the Bushahr State, with a view to extending their operations for procuring sleepers from this region. The following remarks by Cleghorn are based on Mr. Strong's Report (dated December, 1861), and on his own observations in the forests of the valley, extending from the small station of Kotghur, beyond Simla, to the village of Kanam, three marches above Chini, beyond which the deodar ceases to flourish.

The tract in the Sutlej Valley producing deodar lies between $77^{\circ} 59'$ and $78^{\circ} 31'$ East Longitude and $31^{\circ} 23\frac{1}{2}'$ and $31^{\circ} 40'$ North Latitude.

By 1862 all the good deodar trees had in the preceding few years been felled on the areas within three miles of the river in the territories of Mandi and Sukhet, and in the Hill States of Koti, Kamharsen and Bagi, which overlook the Sutlej ; but the interior hills of Bushahr were extensively clothed with the finest deodar, particularly on the upper parts of the northern slopes, commencing at Nachar, and terminating near the Hangarang Ridge, which forms the northern limit of the species, and of all tree growth except birch and juniper. This stretch of country is situated on the banks of the Upper Sutlej and Baspa rivers. Cleghorn considered the forests sufficient, if worked with care and good management, to yield 8000 trees annually, or 200,000 cubic feet of timber to supply the requirements of the Railway and Public Works Department, and for the wants of the people in the Cis and Trans-Sutlej States, without trenching on the capital of the Bushahr State.

They must have been a wonderful sight, these forests at that time. Many deodars were seen in the neighbourhood of the Hindustan-Tibet road of 20 feet in girth and 100 to 130 feet in height, and Cleghorn measured one 28 feet in circumference at 4 feet from the ground, "and several in the clump were not much less." Another tree in this locality had been previously measured as 36 feet in girth, but it was divided into two trunks. In many places, however, much of the finest timber had already been felled in the accessible spots, no attention was paid to the preservation of the young trees, and the waste due to crude and careless methods of felling and extraction was appalling. Strong commented upon this aspect of the question, remarking that there was urgent need of an improved system of felling, slipping, dressing into logs, and so forth. The trees were cut at any height most convenient to the axe-man, thus leaving stumps 4 to 6 feet in height which prevented the logs being got down to the river below. Logs often jammed between two high stumps and were then left to rot, as it did not pay the contractor to spend time on getting them free. The axemen felled the tree laterally ; if it inclined down the hill the trunk broke, if up, their lives were endangered. Cleghorn agreed with Strong that a regulation should be introduced making it imperative that the trees be felled within 2 feet of the ground, that no tree of less than 9 feet girth be felled, and that all trees to be cut should be previously marked, "which would ensure the careful selection of timber

and the preservation of the young trees, thus benefiting the Raja as proprietor, and the Railway Company as purchaser."

When the forest was not situated so that the trees could be felled close to or into the water, the contractors selected trees of second class dimensions, 9 to 10 feet in girth, and after felling them divided the trunk into short lengths for easy water transport. "Out of several thousand logs which I saw," writes Cleghorn, "very few exceeded 12 feet in length, being cut expressly for conversion into railway sleepers. The contractors assert that the addition of several feet in length increases the cost of moving the log to the river, whilst it diminishes the chance of its reaching the plains. Consequently the finest trees are divided into 3, 6, or even 8 logs, and a straight trunk fit for the mast of a ship is reduced to 10 feet lengths. The mutilation of noble trees is most distressing, when we remember how highly these long logs are prized by the Engineers, and how many public works of this country have been delayed because timber of the required dimensions could not be procured."

Cleghorn must have been thinking of the teak forests of Malabar when he wrote this. The idea of bringing out ships' masts down the rocky, tortuous, steeply graded rivers of the Himalaya is an extraordinary one for him to have entertained, especially as he describes so clearly the difficulties of floating out timber by these rivers.

The timber slides in use, he says, showed little care or knowledge in the selection of suitable sites, and but little expense would be required to improve them by a person with the requisite knowledge. In one place eighteen logs out of twenty sent down a slip-way were splintered to pieces, the native in charge continuing to send them down, although he saw the certain disaster which faced them. The contractors at this period apparently found that if *one log in ten* eventually reached its destination it amply paid them, and the destruction of timber and waste was of no account to them. It certainly was time for Government to step in and put an end to such a condition of affairs. For areas in which trees overhung precipices and in other places from which it could not be removed without certain injury in the summer (the ordinary working season), Cleghorn advised the adoption of the American system of rolling the logs during the winter months over the hardened snow, which at that season filled up the hollows and covered the country. Mr. J. D. Smithe, the newly appointed

Superintendent of the Chenab and Ravi Forests, had apparently successfully practised this operation on the banks of the Ravi.

As regards the Sutlej as a floating river, Cleghorn considered it to be fully adapted for this purpose. A little blasting might be necessary in the future, but he was not prepared to recommend such work. A good superintendent, after several years' experience of the river, would be in the position to make adequate proposals on this head. He alluded to the inadequate system of marking their logs by contractors, and the confusion and trouble which reigned owing to the great number of marks in existence, each contractor using several different marks. He suggested that each contractor should register, after approval, one mark only in the Rajah's office at Rampur and in the Civil Court at Simla.

The deodar forests of the Upper Sutlej were the property of the Rajah of Bushahr, with the exception of the groves attached to temples, which were religiously preserved. Persons contracting to supply the Railway Company or the Public Works Department arranged with the Rajah and obtained permits to fell trees in certain localities. Previously to Mr. Barnes' visit to Bushahr, in 1859, a bag of rupees secured a permit for felling a forest tract, containing an indefinite number of trees. Mr. Barnes, the Commissioner, insisted that payment should be made for individual trees, and not for portions of forest. He wrote, "Up to the present year speculators could come up and cut at their pleasure, floating the timber down the river to Loodiana and Ferozepore, *without paying anything* to the Raja. I have now placed this Department under the Wazeers. A rate of two rupees a tree has been fixed as a fair average price, and a speculator must now present a written application specifying the number of trees he requires. A portion of the money will be realised in advance, and an official deputed to see that only the proper quantity is felled, and that the balance is paid before the timber is brought to the river" (28th November, 1859).

This procedure, as Cleghorn remarked, was a step of progress; it was already in existence in the Ravi and Chenab Forests, and was found to secure the selection of well-grown timber, and to a certain extent, but only to a certain extent it may be remarked, a more careful felling of the trees. The working season was in the summer, May to October, dependent on when the passes were free from snow, the axe-men coming chiefly from Mandi and Kulu. The earlier they could com-

mence the better, as there would be then more logs ready to float down the river when the first rains of the monsoon commenced, usually in July.

The most enterprising contractor at this period, and the one giving the most trouble to the Rajah, was a Mr. T. Arratoon, an Armenian merchant who was felling at Nachar, Dippi and in several other places. Cleghorn had already discussed matters with this gentleman in Lahore, and the latter, not desiring a second interview, took care to leave (on the opposite bank !) on the very day Cleghorn arrived at one of his areas up the river. This contractor strongly disapproved of the Commissioner's order of payment for individual trees felled, stating that he had concessions from the Rajah who, being of a weak and vacillating character, he evidently treated in an overbearing manner. But Arratoon apparently never attempted to submit proofs of his so-called "claims," or concessions.

In discussing the proportion of logs which safely reached the plains, Cleghorn says that no register was kept; but from his own observations he considered "that as much as one-third of the timber put into the river to be floated down was lost in the passage. Again, a great number of logs launched from the slides in Bushahr, do not reach the Rupar Depôt in the Loodiana District. I should say that from one-third to one-fourth of the logs felled in the basin of the Sutlej become available for the construction of public works in the Punjab, within two or three years after they are dressed"; this estimate nearly coinciding with one framed by Brandreth. During a visit paid to the Rupar Depôt in the winter he saw a stock of several hundred short logs, many of them splintered and shaken, owing to the treatment they received during extraction, and some very water worn, owing to their having been in the river 3 to 4 years. A gang of thirty sawyers were at work, "using both straight and curved saws, in the management of which they are tolerably proficient." The rafting of the logs commenced about twenty-five miles above Rupar, 10 to 12 logs being tied together by grass ropes passed through the drag-holes in the usual manner.

Cleghorn comments upon the fact, which was subsequently to persist for so long, that the contractors would only deal in deodar wood and "will continue to do so as long as this prized timber is procurable within easy distance of the river." It was a repetition of the practice of the southern contractors

in the case of teak. A native of Rampur had that season felled a considerable quantity of *Pinus longifolia*, near Serahan, which was a timber well suited for building purposes, and blue pine was used where deodar was scarce. But these timbers with the silver fir, spruce and the three oaks, *Q. incana*, *dilatata* and *semecarpifolia*, although widely distributed in the Western Himalayan Forests and abundant, were scouted by the trade. The Departments of Government using timber were as much to blame as the contractors, since in many cases they refused to purchase any other timber but deodar. Consequently hundreds of thousands of fine deodar trees, with their beautifully scented timber, went to sleep the tracts of the new Punjab railway system.

The oak forests also received notice from Cleghorn. He reported trees of great size 80 to 100 feet in height, the timber of which had, he said, been well reported on. "When the road to Narkanda is opened out fine straight logs of oak may be brought into Simla. If approved by the railway officers, this timber might be supplied from the Hill States, and launched below Kotgurh supported by bamboos (as it does not float till thoroughly seasoned, a process of several years), or lashed to pine logs." He suggested that as oak was used for sleepers in North America it might be tried here. He also listed other existing timbers, and concluded, "It is indispensably necessary that an European officer of experience, intelligence and energy should be appointed to superintend the working of these valuable forests, and the Raja is anxious for improvements. From all I heard at Rampur, of the trouble he experiences in realising a small and uncertain revenue from his forests, there is reason to believe that he would readily agree to lease them on equitable terms, or a seignorage per tree, as is now paid to the Chamba Raja for those cut in the Pangi and Ravi valleys. The exportation of timber ought to be a steady source of revenue to His Highness, and of employment to the thinly scattered population of Bashahr. . . . To allow contractors of all kinds, without capital, experience or scientific knowledge, to exhaust these deodar forests, as they are now doing, is to sacrifice the interests of the Raja, and to occasion prospective evil to the Punjab. In a few years little timber would be procurable and the remedy too late of application."

Cleghorn recommended the systematic working of the forests of the Sutlej and Baspa on a similar plan to that adopted on

the Chenab under Smith for the Chamba Forests, which was proving eminently successful. The duty of the European officer whose appointment he advocated would be to examine and map all the forests; fix annually the felling places in rotation; to allow felling only where the logs could be removed; to select and test the working of timber slips; and to prevent damage of every kind.

Cleghorn gave the probable outturn of timber for 1862-3 (supposing average floods) on the Sutlej, Ravi and Chenab rivers as : Sutlej, 150,000 cubic feet; Ravi, 100,000 cubic feet; Chenab, 700,000 cubic feet; and attributed the figures to the result of the successful working of the Pangi Forests on the Chenab. As the best means of arresting the wasteful destruction on the Upper Sutlej, he advocated the establishment of a timber agency on the Sutlej which would render available at Rupar a large supply of fine timber for engineering works.

The Baspa Valley has been mentioned. The Baspa River is a large feeder of the Sutlej, rising behind the cluster of Raldang peaks near the boundary of Bushahr and Garhwal; both valley and stream are famed for their beauty. The valley was said at this time to contain magnificent deodar, and the contractor, Arratoon, felled trees on the Baspa in 1862. The stream was practicable for timber operations up to Sangla, and it was considered that the valley held the prospect of a considerable supply of deodar timber.

The question of appointing a European officer to the charge of the forests of Bushahr was taken up by Government. The Rajah, on being asked by the Superintendent of the Hill States whether he would agree to such an appointment, at once assented, and subsequently submitted a formal letter asking that such an appointment should be made, stating that "Mr. Arratoon and other merchants give me much trouble; they set at defiance the orders which Mr. G. C. Barnes issued, and repeated by you" (Colonel R. Lawrence, the Superintendent of the Hill States), "and therefore I shall be much obliged if Government could assist me in preserving the forests, and by preventing these men from cutting trees at their own pleasure," (Signed) "Shumshere Sing, Raja of Bushahr and Rampur."

In a second letter he stated that he was "quite willing to give to the British officer whom Government may appoint to look after my forests, the sole control over the forests in the

territories of Rampur and Bushahr. The contractors ought to be prevented cutting wood except on the sites that he may point out for them to cut. I am further glad to perceive, in the conclusion of your same letter, that all payments would be made direct to me through your office from time to time." This latter was in accordance with Lawrence's proposal agreed to by Sir H. Edwardes, the Agent to the Lieutenant-Governor for the Cis-Sutlej States, that the officer should be under the orders of the Superintendent, Hill States, should live in the State, should be paid from the forest revenues, and that the latter should be paid into the Superintendent's office and be refunded periodically to the Rajah. The Rajah wished to raise the seignorage per tree, and Cleghorn had agreed to this, stating that Rs.3.8 per tree for deodar would be a fair rate.

This timely action undoubtedly saved the Bushahr deodar forests (since known, if but slightly, to so many of Simla's residents and visitors) from utter ruin, in which the Hill State concerned would have been involved.

In 1864 Brandis prepared a valuation Survey Report on the Bushahr Forests, which gave exact information on their resources.

Cleghorn attaches a general description of the Sutlej Valley to his Report, which need not be treated of here, since the valley is now well known. He mentions, however, the square towers of the remarkable wooden bridge which crossed the river at Wangtu. The bridge had been destroyed during the Gurkha invasion (*Gerard*, p. 37—the man after whom the *Pinus Gerardiana* was named, a tree which begins to appear above Wangtu, after crossing the bridge); the beams laid across were renewed in 1859. The permanence of this bridge was of vital consequence to the trade with Central Asia, since there was no other bridge in Kunawar by which laden sheep (used as pack animals here) and mules could cross.

Cleghorn also describes the *jhulas*, or rope bridges, which then existed at Rampur (and did in 1906-7), above Serahan, and at Pearcee. These are common in the inner Western Himalaya, either swinging or suspension bridges, but neither suited to the passage of animals. The swinging bridge is a single rope slung across the river with a loop passed over a small pulley wheel. The passenger sits in the loop, as in a swing, and is pulled, by a lighter rope attached to the pulley, over the yawning chasm, forty feet or more below, filled by a rushing, turbulent river, foaming over rocks and boulders. These

mountain bridges are not crossings for those afflicted with nerves.

THE VALLEY OF THE BEAS

The Beas is considered to be identical with the Hyphasis of Arrian, the Greek name being a corruption of the Sanscrit Vipasa. The Beas takes its name from a sacred pool at its source called "Vyas Rikki," situated in the Rotang Pass, at the head of the Kulu Valley, the elevation of which is 13,000 feet. The river flows southwards for 75 miles through the British district of Kulu, then bends towards Mandi and debouches from the hills at Mirthal, after a winding westerly course of 125 miles.

In August, 1862, Cleghorn and Mr. J. D. Smith crossed the Rotang from Lahul, separating at Sultanpur, the former continuing along the bank of the River Larji, noting the forest resources of the valley and the numerous tributaries which flow into the Beas, which were of considerable importance from the forestry point of view. The road over the Rotang consisted of an irregular flight of stone steps nearly four miles in length, the descent being very slippery and fatiguing. The steps naturally interfered seriously with the progress of animals—especially loaded animals—and were a serious inconvenience to the traffic of that day on what was an important line of communication.

Lahul was treeless. "In the valley of Chandra for 5 or 6 miles there is not a bush to be seen." On crossing the pass the change to the well-wooded slopes of Kulu was a striking one. On the higher slopes were birch and alpine oak, silver fir, spruce and blue pine, and lower down deodar, alder, elms and poplar and orchards of fruit trees round the numerous villages. The scenery of the Beas is very beautiful, differing from that of the Sutlej and Chenab, the river terraces being much wider and the mountain slopes presenting fewer scarps and precipitous rocks. The river itself is fringed with trees and studded with green islands, almost unique in the Western Himalayan rivers, and, as exceptional, there is a good riding path along the bank. These being the characteristics of this favoured valley it is not a matter of surprise that it had already been discovered by settlers, numerous European planters, and so forth, having settled in the valley, which had a considerable native population. As a natural consequence a great deal of the forest with which it was originally filled had been cleared

away. Compared with Chamba and Bushahr the deodar forests were of limited extent and the average size of the trees smaller (4 to 8 feet in girth).

No less than nine notable tributaries flow into the Beas in Kulu, which to some extent accounts for its striking scenery. These tributaries, the valley of each of which Cleghorn explored, he describes as follows :

"(1) Seragi, unfordable and spanned by a wooden bridge 3 miles from Burwa.

(2) Monali, a very considerable stream.

(3) Raini, rises in Spiti, rapid and impracticable for transport.

(4) Phari or Pharini, spanned by a wooden bridge, 60 feet long.

(5) Doangnu, a mountain torrent, rushing over large rocks.

(6) Parbati, nearly as large as the Beas, with a course of 50 miles. Deodar logs have been floated down it, and it was inspected by Major Longden in 1852. The hot springs at Manikarn are much frequented by pilgrims. West of this, near the village of Choji, the Parbati is much obstructed by massive rocks, and logs can only pass when the river is in flood ; lower down the bed is clear, and the stream increases rapidly in size as it flows towards the Beas.

(7) Sirbiri, a considerable feeder, rising in the mountains of Bara Banghal. A small amount of deodar near the village of Luma, five miles from the junction at Sultanpur. Timber can only come down in full flood. Blue pine and "tos" (silver fir) are abundant in the valley of the Sirbiri.

(8) Bijoura, this stream divides Mandi from Kulu and irrigates several tea plantations.

(9) Goput or Gomati, joining on the left bank, is small and ill adapted for transporting timber, which can only come down during a flood : in this respect all the streams in Kulu are alike."

It has been said that Cleghorn found that the deodar forests in Kulu were small in extent compared with Chamba and Bushahr. The tree occurred in various parts of the district, but was nowhere abundant. The only locality where a considerable forest existed was in the higher part of the valley, above Jagatsukh, between Manoli and Burwa, on the Beas, at an elevation of 7000 feet. This forest (Manoli) extended in a narrow strip four miles in length, for the most part on the

right bank of the Beas. There were patches and groves lower down on both sides at some height above the river. Major Longden visited it in 1852 (*vide p. 264*). Cleghorn estimated that there were not "in the aggregate perhaps 10,000 mature trees in the valley. A considerable quantity of dead and fallen timber is scattered through the forests."

It has been shown that Mr. Ter Arratoon felled some fine trees in this forest as far back as 1848, and native merchants had followed him, in proof of which several hundred large stumps were seen in the Burwa plain. The girth of many of these stumps Cleghorn records as fully eight feet, and from countings of the annual rings on the stumps the average age was ascertained to be seventy years. He adds the following: "The stumps *very frequently* give off perpendicular shoots or horizontal ones which become perpendicular, forming an elbow. This *remarkable fact* of a coniferous tree being reproduced from the stump has also been observed by Brandis in the Deodar Forests between the Tons and Jumna." Few native merchants had applied for permission to fell in the Manoli Forests latterly, it being doubtful whether those who had tried the business found it a paying speculation. "Many of the remaining trees," says Cleghorn, "are undersized and are not worth five rupees per tree (the required seignorage), according to the present market value of timber." But he considered that Barnes' estimate of 1851, that not more than Rs.5,000 worth of deodar timber per annum could be supplied from Kulu was now much under the prospective annual returns from the Kulu Forests. The trees in the Monali Forest grew chiefly close to the edge of the river, down which it was practicable to float timber, and under these circumstances Cleghorn strongly recommended that the forest should be reserved for Government purposes, owing to three special advantages the area possessed: (1) Easy of access; (2) convenient for supervision, as it was near the Assistant Commissioner's Head-quarters at Nuggur; and (3) within British territory. The timber could be launched into the Beas "without much breakage (always a heavy percentage), owing to the bank of the river at this point being low.

The breadth of the Parbati is about 100 feet, and the body of water at the confluence is nearly as large as the Beas. Longden, in 1852, found some patches of deodar, chiefly at Jerri and Uchich, which were conveniently situated to the stream and had been partly felled. This forest, though limited,

appeared to the latter suitable for conservancy and generally to resemble the Manoli Forest. Some large logs had been extracted from it in the fellings of fifteen years previously. "It is of great moment," wrote Cleghorn, "to reserve specially these Government forests on the Beas, which will always be within control, and which (Monali and Parbati) under good management will yield a perpetual supply of good timber."

The principal difficulty in floating timber down the Beas, owing to the great fall of the river (this rapid drop being common to all these Himalayan rivers), was the existence of the numerous islands fringed with alders. The islands did not injure the logs, as rocks did, but arrested their progress. After the month of August great labour was required to move the stranded logs. The rafting of the timber commenced at Nadaon, and rafts proceeded easily as far as Dehra. Below Dehra the river divided into several channels which dried considerably in the cold weather, thus preventing large rafts from passing. Below Mirthal these channels reunited and rafts proceeded without difficulty to Hari-ki-ghat, where the Beas joined the Sutlej. The united stream is then called the Ghara till it joins the Chenab. The working season in the Kulu Valley began earlier and was more certain than in the Sutlej Valley, Kulu being accessible at all seasons. Owing to the extensive cultivation in the valley care would have to be exercised in getting the logs to water, and Cleghorn suggested that buffaloes could profitably be employed in dragging the logs over definite tracks through the fields to the river, the logs being placed upon a pair of small wheels to save damage to the cultivation. He also advocated sawing up the timber *in situ* by which a great saving of material would ensue, as the trees were near the river and the area in British territory.

The prospective requirements of the Punjab Railway from the forests of the Beas, for 1863 and 1864, were 400,000 cubic feet of timber. With reference to this demand he wrote : "The principal deodar forests are those on the Manoli and Parbati streams in Kulu; these as already intimated are of limited extent, and even if all the ripe trees were felled this large quantity could not be supplied. With diligent search and economic cutting, perhaps one half as a maximum may be expected. If creosoted *Pinus longifolia* should meet with approval, a large amount may be brought from the Kangra and other hills."

Referring to the other species of trees which grew in the

Beas Valley and on its tributaries Cleghorn wrote that there was an abundance of blue pine, elm, maple, oak (two species) and walnut on the Upper Beas. On the Parbati near the sacred hot spring there was a considerable supply of box (for which there was then a market, the trees being larger and more abundant in this valley than in other parts of the Himalaya), *Cupressus torulosa*, olive, and a large forest of *Pinus longifolia*.

The abundance of these trees was also noticed on the numerous subsidiary streams which fed the main tributaries of the Beas already enumerated. There was a small tract of deodar near the source of the Sukhet which was being felled by the Rajah in 1863. The deodar forests situated at Bara Banghal in British territory, discovered by Longden in 1853, where surreptitious felling was then taking place, were thought to have partially recovered by 1863, as no felling had since taken place in them, the forests being difficult of access from the Ravi side and separated from the Beas by the snowy range on the other. An excellent tabular list of useful trees and shrubs of Kulu and Kangra is given in the Report.

In the foot hills of this region the two Hoshiapur *P. longifolia* forests, known as Pungal and Lohara, were supervised by native watchmen, and gave a small annual revenue. The applications for wood were chiefly from merchants of Amritsar who paid Rs.5 royalty per tree, the logs being floated down the Beas from Dehra.

In the Sewalik range of hills two bamboo forests, called Bindraban and Karrampure, were placed under conservation in 1859 by Colonel Lake. One was worked and the other closed for four consecutive years. Printed passes were furnished at the tahseel, stating whether the bamboos were required to go by land or water. The price of the best description was Rs.3 per 100, with a charge of eight annas for cutting them.

"Four species of bamboo occur in the Kangra District : *Bambusa arundinacea* ; the hollow bamboo of the plains ; *B. stricta* (*Dendrocalamus strictus*) the solid bamboo of the lower hills, of which spear handles and clubs are made ; *Arundinaria utilis*, small bamboo of the hills (5 to 8000 feet) ; and *A. falcata*, smaller hill bamboo, growing up to 11 to 12,000 feet."

"The plain of the Jullundur Doab," wrote Cleghorn, "between the Sutlej and Beas rivers, presents in the cold weather a sheet of rich cultivation. Jullundur and Hoshiarpur are highly ornamented with avenues of trees ; but the district

THE FORESTS OF INDIA

generally is scantily wooded. There is no indigenous timber for building purposes. The principal woods used are *Pinus longifolia* and mango; the former is supplied from certain forests in Hoshiarpur and Kangra, on application to the tahsildar and prepayment of seignorage. Bamboos are likewise available in the low hills at Rs.3 per 100. Along the slopes of the Dhaola Dhar, there are considerable forests of *Pinus longifolia*, *Quercus incana*, elm, horse-chestnut and walnut. Deodar is brought from the higher hills by the Sutlej and Beas rivers, but the supply is uncertain and very inadequate."

The following statement shows the Forest Revenue of Kangra, including Kulu, for the period 1858-9 to 1862-3:

Year.	Forest Income.			Cost of Establishment.		
	Rs.	a.	p.	Rs.	a.	p.
1858-59	4538	6	9	84	0	0
1859-60	6026	0	II	84	0	0
1860-61	5276	6	I	1128	0	0
1861-62	6152	2	4	2280	0	0
1862-63	7012	I	I	2580	0	0

The Forest Establishment consisted of 1 Munshi, 4 Head Rangers, 2 Rangers and 11 Peons, costing Rs.215 in all per mensem. The kinds of wood sold were *Pinus longifolia* and oak, 4949 trees; decayed trees, 1674; bamboos, 69,980.

The following statement shows the Forest Revenue realised in the district of Hoshiarpur, 1858-63:

Year.	Forest Revenue.	Credited to Government.			Credited to Forest Fund.			Paid to owner of land and others.			Cost of Establishment.			Miscellaneous expenditure.		
		Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
1858-59	6166	13	10	0	5924	3	0	...	177	10	10	65	0	0	...	
1859-60	8124	10	8	0	7504	14	0	...	331	12	8	288	0	0	...	
1860-61	5550	7	9	0	5060	11	7	...	201	12	2	288	0	0	...	
1861-62	6586	8	8	0	438	9	5	5237	1	I	617	14	2	288	0	0
1862-63	8452	2	6	0	799	9	8	5864	I	0	738	9	7	348	0	0
Total.	34,880	11	5	0	19,727	15	8	11,101	2	I	2067	11	5	1277	0	0
														706	14	3

The Establishment consisted of seven "Forest Rangers" drawing a total of Rs.29 per mensem between them.

In 1862-3 the revenue was distributed in the following proportion :

	Rs.	a.	p.
From the <i>Pinus longifolia</i> forests .	2242	7	4
From the Bamboo forests . . .	6209	11	2
	<hr/>		
	8452	2	6

Cleghorn refers to the Report of the Committee appointed by Sir John Lawrence in 1856 to consider the matter of the iron works of Kangra and Mandi (already dealt with in Chapter XV) and its bearing on the forestry question, since iron smelting made large demands on the forests for wood. He concluded his Report of the Beas as follows : " Considering the enormous indents for railway sleepers, for the next 3 years at least, the pressing demands for other public works, the great consumption of fuel for iron manufacture, and the prospective want of wood for tea boxes in Kangra Valley, I recommend the immediate nomination of an officer to carry out the necessary operations (marking trees, launching logs, and registering the seignorage) in communication with the revenue authorities of the district. It is impossible to prevent the felling of trees placed in such a convenient locality as Manoli without an Assistant Conservator, whose services would be of great value in examining the forest resources of this division and in carrying out strict conservancy management. The forests of Kulu are extensive, but the woods of Kangra and Hoshiarpur are open and sparse. They have all acquired an increased value from the advancing prosperity of the district and the approach of railways. Heavy drains are being made upon them, and the remaining woods must be husbanded and turned to account as much as possible. This can only be effected by the reservation of tracts as Government domains, and the marking of mature trees by skilled persons to meet the annual demands."

What an advance this is upon the old ideas which were prevalent for over half a century !

THE VALLEY OF THE RAVI RIVER

Cleghorn crossed from Holta, in the Kangra District, to the head waters of the Ravi River in Chamba by the Waru Pass. The only previous record of a European having crossed this part of the Dhaola Dhar (White Mountain) was that of Mr. P. Egerton, C.S. Cleghorn made the journey in the last week

of June, 1862, in wet weather, as the monsoon had broken, but was fortunate in obtaining a very fine view from the top of the pass (12,500 feet). He joined Mr. Smithe, the Superintendent of the Chenab and Ravi Forests, at Agralli on the Chamba side, elevation 8000 feet.

The Ravi is the smallest and most rapid of the Punjab rivers. It rises in the British pargannah of Bara Banghal, and continues its intramontane course for 150 miles, debouching at Shahpur. General A. Cunningham was the first European to visit its source. In Bara Banghal the river is called the Rawa, and is formed by several impetuous streams issuing from large glaciers of 14,000 feet on the south side of the Mid-Himalaya, and hence the floods come down earlier than in the other Punjab rivers and subside sooner. The bed was at this period obstructed by rocks for many miles during its passage through the districts of Bara Banghal and Bara Bansu into Chamba. About forty miles below its source the Ravi proper is joined by two large tributaries, the Budhil and the Nai or Duna.

There was not, Cleghorn records, a large supply of deodar at the head of the Ravi, either in the territory of the Rajah of Chamba, or in the British district of Bara Banghal. The mature trees adjacent to the river had been felled to a great extent, and those remaining were generally immature or high on the banks.

The District of Bara Banghal is shut in with high hills on every side, the Ravi flowing through a cleft in the rocks, and is comparatively rainless. The drainage basin of the river in this part is therefore comparatively narrow. The great floods in the Lower Ravi are from the Seul, which flows through a wide open valley; from the Siawa, and from other streams below Chamba where the high hills recede and the periodical rains fall in abundance.

The Budhil Stream, rising in the Lahul Range, issues in part from the sacred lake at Rani-Mahes, a mountain much frequented by Hindu pilgrims. Barmawar, the ancient capital of the Barma family, is beautifully situated over the stream, and the carved temples are shaded by lofty deodar trees. The Rajahs of Chamba for long carefully preserved the forests fringing the holy Budhil, but felling was commenced here by the then Rajah in 1858, in order to supply the British Government, and when granting permission to carry on forest operations in 1860 the district of Barmawar was specially named



AN ORDINARY TIMBER SLIDE, PUNJAB HIMALAYA (CIRCA 1862)
From India Office Album



by the Rajah as being considered suitable for the work ; the forest within a certain distance from the temples being reserved. This forms a striking, if somewhat sad, illustration of how the tempting offer of great profits from a source hitherto held sacred, for this particular deodar forest must have been revered by many for a long period, overcame the Rajah's religious feelings. And incidentally afforded evidence of how strong even then the craze for this particular timber animated one and all.

Felling had been carried out by a contractor in 1860-1 on the Nai River, which rises in the Kalidebi Pass, and has a course of thirty miles to its confluence with the Ravi. Cleghorn considered that it was very desirable that this small valley should be examined with a view to forest operations, as a fair portion of the annual supply might be obtained from it.

The Seul, coming from the north, drains a considerable basin between Chamba and Badrawar, joining the Ravi below the capital. Rising near the Sach Pass the Seul receives several long impetuous tributaries, at the heads of which clumps of deodar occurred ; but owing to their configuration they were difficult for floating purposes : for instance, the sides of the Tisa nullah were only 20 feet apart and 162 feet above the water. Longden, in 1851, reported that 5000 logs might be expected annually from the valley, and Cleghorn and Smithe considered this estimate a probable one in 1861 ; but it would entail a considerable labour force and adequate supervision, as the forests were scattered and separated from each other by deep ravines. The Seul Valley is open and fertile, and was termed the "Garden of Chamba," supplying the capital and Dalhousie with grain. No good road existed, and Cleghorn recommended that the existing track should be improved, as it would be useful alike to the Forest Department in proceeding to and from Pangi, to the local inhabitants and to travellers.

The Siawa falls into the Ravi above Bissoli. It was by this stream that deodar timber had been, and could still be, brought down from the territories of Jummu. The Maharajah of Kashmir had kept the felling of timber in his own hands apparently, and only sold to merchants when it had been brought to the river banks, following the plan adopted years previously by the Rajah of Nilumbur in Madras, as has been narrated. "By this wise policy," says the Doctor,

"contractors not having ingress into the forests, the wooded tracts of Jummu are almost uninjured."

The species of timber and other trees seen on the Ravi were similar to those already described in the other valleys.

Pinus longifolia first occurred between Guriah and Chatrari, and was abundant between Chamba and Shahpur. Allusion is made to the Paper Shrub (*Desmodium*), which was very plentiful in the districts of Chota and Bara Banghal and in the Ravi Valley; "the plant having a wider range, and the bark being more easily stripped off, the fibre will be available in the plains at a less cost than that of *Daphne papyracea*."

At Chamba a new residence was being built for the Rajah at this date, and a large wooden bridge rebuilt across the Ravi. Except for the road to Dalhousie, twenty-four miles in length and passable for horses, the only riding path from the capital led towards Seul. Moving about the district was, therefore, very difficult. "The tracks could scarcely be worse, in many places they are steep zigzag paths, exceedingly rugged and dangerous, affording an insecure footing, and from a false step there is no recovery." But it was believed that improvements in the communications were imminent. Communications at that period were undoubtedly almost non-existent (save the zigzag footpaths, which exist in plenty throughout the Himalaya at the present day), but Cleghorn, with his Madras experience only, would naturally be unprepared for the tracks to which the Himalayan traveller or official soon becomes accustomed.

The commencement of the timber transactions between the British and the Chamba State in 1854 has been already glanced at in Chapter XV. They had proved a failure, as the Chamba Authorities failed to keep their agreement. Repeated remonstrances had been addressed to them. In May, 1858, we find the Authorities pleading that the chief difficulties occurred from the obstructions in the bed of the river near Chun, thirty-five miles above Shahpur. The Chief Commissioner, therefore, directed that the Rajah's timber should be taken over above that point. But the excuse was only a method of Oriental evasion. For three years the new arrangement was carried out, without, however, any improvement in the supplies of timber coming down the river. Several representations were addressed to the Rajah by Lake, the Commissioner of the Trans-Sutlej States, and the latter consented in December, 1860, to an arrangement whereby the

British Government should fell timber in his territory, on the following conditions :

- (1) That no wood be cut except that indicated by a servant of the Rajah, deputed for the purpose.
- (2) That payment be made at the time of felling.
- (3) That supplies and work-people be provided by the Canal Officers.
- (4) That the Canal Officers pay for the timber (trees felled) at the market rate.

Felling operations commenced under these conditions in the following working season (1861). It was supposed that the new arrangement would increase the quantity of timber and maintain a constant supply of good quality, which was now the more necessary to keep running the new saw mills at Madhopur, which had been erected in the beginning of the year. During the first year seventy-two gangs of work-people were employed, receiving payment in cash at rates higher than they were accustomed to, with which, says Cleghorn, they informed him they were well pleased! During the year 13,784 deodar logs were put into the river on the Upper Ravi and Budhil rivers, half being upwards of 20 feet in length. Owing to an imperfect knowledge of the rivers and to late launching only 2000 logs reached Madhopur during the year.

In March, 1862, the Chenab and Ravi Forest Agencies were united and placed under Mr. Smithe, C.E., and an assistant, Mr. Doering, Assistant Civil Engineer, was appointed to the Ravi. During this year, 18,248 logs were put into the river.

In 1862 fifty-one galls (ravines with timber slides) were in operation over the Ravi and its tributaries. These slides were classified according to breakage of logs in transit as follows :

Under 5% breakage of logs	1st class slide.
" 15% " " "	2nd " "
Above 15% " " "	3rd " "

A somewhat extraordinary classification. But it will be remembered that the people were quite untrained to work carefully (and the Indian shows himself often to be lamentably careless), the country was a difficult one, and as often as not the place originally chosen for the slide was quite unsuitable. The inevitable result was that the greater proportion of the slides in existence in the region were of the 3rd class.

The forests of the Ravi were divided into four working districts, viz. Danchru, at the head of the Ravi; Huli, a little lower down; Chenota, over the Kuarsi; and Barmawar, over the Budhil. In the first district after the year's felling only 500 trees fit for cutting remained, and 1000 undersized ones. The district was not suitable for planting. In Huli about 1600 mature trees remained available, and upwards of 4000 undersized trees. Four of the ravines near the river were considered suitable for planting trees, and in two of them there was now much fine young timber.

Information regarding the timber resources of the Chenota District was not available. The Kuarsi Stream, down which the timber came in the fellings of 1861-2, was rocky and contained little water, the timber taking a long time to reach the Ravi.

In the Barmawar District 1800 mature trees remained, and the undersized ones were estimated at 3500, many being little under the standard size of 8 feet in girth. "The deodar," remarks Cleghorn, "appears to thrive well in this district, which is favourably situated for plantations. There has been much felling, and trees are no longer plentiful. The large proportion of good galls in Barmawar renders strict conservancy desirable."

The figures of the stock remaining in the district were estimates made by Smithe during the first season's work. Cleghorn subsequently asked Smithe's successor, Lieutenant Chalmers, to inspect the various tributaries and to prepare a sketch map, showing the numbers of trees on each stream, since it was of considerable importance to check the first estimates made. This work was carried out, and the two sets of figures accorded sufficiently to prove in Cleghorn's opinion "that in 1864 the felling of deodar trees must be very limited.

"The trees yield on an average four logs, each containing 25 cubic feet. The cost of cutting and carriage to the river is about one rupee per log. Mr. Smithe calculates, that after paying Rs.5 seignorage per tree to the Raja, and allowing for breakage, losses and sundry expenses, deodar logs may be eventually landed at Madhopur at 4 annas per cubic foot, but to me this seems doubtful. There are various obstructions which render this rate problematical. Many new slides must be opened, and until they are in order the breakage is very great; but the chief obstacle to such a rate is the heavy loss

from the appropriation of timber by native merchants and others, who live by an illicit trade in wood.

"The large cities of Amritsar and Lahore being near the Ravi, the demand for timber brought down this river has been very large for many years. The forests in Chamba require rest, and it would be to the interest of the Raja to reduce the felling to an annual average of 5000 trees, including every species of useful timber. The proposed arrangement of a long lease is absolutely necessary for the protection of the forests, which at the present rate of felling will not yield mature trees for more than five years."

Chamba was lucky in that the forests were not entirely exhausted of large timber before forest conservancy began to make its appearance in India. For assuredly otherwise the total destruction of its forests would have proceeded on the lines of the Malabar, Bombay and Tenasserim teak forests, the immature trees being felled as soon as all the mature ones had been cleared out. As it was, from Cleghorn's remarks, it is obvious that over-felling beyond the possibility of the forests had been prevailing for a couple of decades at least.

The Forest Revenue of Chamba had nearly trebled within ten years, the 1862-3 figures being :

Paid direct to Rajah	Rs.70,000
For labour in Chamba	Rs.60,000
Total	Rs.1,30,000

In 1863-4 the total reached Rs.1,55,000.

The Timber Agent had, says Cleghorn, dealt faithfully with His Highness, paying seignorage on every tree felled, without causing any expenditure to the Rajah, who admitted that traders had not dealt with equal honesty, and was desirous of being relieved of the annoyance connected with endless river disputes. A Superintendent of Chamba, Major Reid, had been recently appointed, and the appointment was calculated to produce beneficial results to the State. The Rajah, having found himself unable to control the various traders and contractors, had requested Major Reid to ascertain the extent of the forests in his territories, and to exercise supervision over the operations of any person who was allowed to fell on the Ravi or Chenab rivers. "The adoption," says Cleghorn, "of our Rules as to girth and low cutting is an important step towards conserving the forests."

The collection of unmarked drift, or waif, as Cleghorn terms it, timber on the river was in a very bad state. Until 1861 the right of collection had been sold annually to the highest bidder by the Deputy Commissioner through whose district the river flowed, with results which all Forest Officers who have had any experience of this matter will readily apprehend. In Chamba, owing to the careless marking of their logs by the horde of timber merchants and their numerous and varying marks, this lease had often proved a profitable speculation, large sums being realised, as well they might. It afforded, it was naïvely remarked, the lessee an opportunity of tempering with the marks and appropriating the timber belonging to merchants, and latterly the temptation had proved so strong that he had ventured to meddle with Government timber! Theft was rife, the operators working at night, detection being said to be almost impossible with the staff entertained; and a far larger one, Mr. Smithe asserted, would not stop the removal of marks and thefts. The trouble and annoyance arising from this malpractice had induced the Government Timber Agent to apply for the right of collecting drift timber himself, which, after some correspondence, was granted in 1860 on payment of Rs.1000 to the district funds at Goordaspore. The result of the Government collection of drift timber, amongst which, it may be taken, there was no stolen timber as had previously been the case, was for 1861-2:

Paid to District Funds for royalty	Rs.1000	0	0
Receipts above expenditure	944	11	6

Paid to Government Rs.1944 11 6

For the year 1862-3 :

Paid to District Funds for royalty	Rs. 804	0	0
Receipts above expenditure	6800	6	10

Paid to Government Rs.7604 6 10

The average annual rate paid to Government, by native contractors for collecting drift timber for the previous five years, was under Rs.1000. "It is, therefore, obvious," said Cleghorn, "that the collection should remain with the Government officer, whose duty requires him frequently to inspect the river; this system will aid in protecting our own timber."

This question had another aspect, at this period an un-

settled one. There are several large islands in the bed of the Ravi, on which much timber was stranded on its way down. The main channel varied, and a river law was much needed. The value of the timber lodging on the islands amounted to several thousands of rupees annually. It had been claimed by the Jummu Authorities and to prevent friction had up to then been yielded to them. The islands were included in British territory in the original settlement maps. "The passive cession," Cleghorn maintained, "of that to which they had no right has made the Jummu Authorities more unreasonable in their demands. It is very desirable that the right to waif on these islands should be definitely settled."

On the subject of the logs launched in the river during any year and those received at the dépôt during that year, Cleghorn remarked that as, of the 18,248 logs launched in 1862-3, none were received during the year, but only those of previous years' launchings, it was of importance to ascertain the proportion of logs launched and received during a series of years.

He strongly advocated the introduction of saw mills, pointing out the great saving in working by machinery and the reduction of waste. With saw mills placed high up on the rivers where they enter the plains the transport to the large towns would only have to be paid on what was actually required by the purchaser, waste and refuse being left at the highest practicable spot. The newly erected saw mill at Madhopur was situated on an island, at the head of the Baree Doab Canal. Its inauguration saved collecting sawyers from amongst the agricultural population, always a matter of difficulty. It had already been shown that when the Government stock of timber was low at the mill private contractors were ready to bring their timber to get it sawn, thus making it possible to keep the mill in full work.

On this island in the bed of the river, formed by the soil from the excavations of the canal, Cleghorn visited a promising young Sissoo plantation, consisting of several thousand seedlings about four years old. The percolation of the water kept the soil and air moist and the situation was favourable for raising young trees. The plantation was, in fact, an experimental nursery from which the canal plantations were supplied. To a smaller extent Australian trees had been on trial for two years. Of these three species of *Eucalyptus* with *Acacia stricta* and *robusta* (from Ootacamund) were in a thriving state and promised well. Captain Dyas, Director of Canals, was

responsible for this planting work. *Casuarina torulosa* and *muricata (equisetifolia)* showed a remarkable growth. In the station of Madhopur olive and oriental plane had also been planted.

A last item of interesting information given is on the subject of hydraulic observations. An account register of the fluctuations of the Ravi had been kept at Madhopur for many years. The gauge was read and recorded every morning and afternoon. A gauge was put up by Smithe in 1863 on the Chenab at Aknoor, and was to be daily registered by the Pangi Timber Agency establishment there. Cleghorn suggested that similar registers might be kept on all the rivers in the Punjab, at as many points as possible, it being an important subject in connection with the floating down of large quantities of timber. "The peculiarities in the rise and fall of the rivers are of great interest to the Hydraulic Engineer, and a knowledge of the variations may in many ways be of value to Government."

A prophetic utterance which was to have far larger issues in the future than Cleghorn could have ever dreamt of.

THE VALLEY OF THE CHENAB RIVER

Next to the Sutlej the Chenab is the largest and longest of the Punjab rivers. From the junction of the Chandra and Bagha at Tandi, in British Lahul, to Akmur, where the river debouches upon the plains, its length is about 300 miles.

Cleghorn marched up the river, for about 100 miles, in company with Smithe and his Assistant, Mr. J. A. Murray; from Durwas, near the Kashmir boundary to Tandi, exploring *en route* the confluent rivers, returning by Koksur and the Rotang Pass to Kulu. In geological and botanical features the Chenab resembles the Sutlej, both rising in arid regions and flowing between lofty ranges of mountains, generally rocky and precipitous, but often finely wooded. The bed of the Chenab is not often interrupted by rocks, and the river consequently offers fewer obstacles to timber transport than any of the other of the Punjab rivers. Except in one or two places, Cleghorn remarks, taroos (men supported on inflated skins who assist in rafting the logs down the river) were not required to disengage stranded logs or break up log jams, until the river reached Akmur.

"The flora of the pergannah (civil division of a district) of Pangi, through which our path lay, agrees in most respects with that of Kunawar. From Durwas to Tilaknath on the

Chenab the same gradual change of vegetation takes place, which is observed from Taranda to Kanam on the Sutlej, the number of species being smaller in Pangi than in Kunawar."

The limits of the deodar tract belonging to Chamba in the Chenab Valley were from the nullah Sansai, which formed the boundary between Chamba and Jummu, up to within two miles of Triloknath, about eighty miles. Above this point the country became too elevated for deodar and blue pine, silver fir, juniper and willow were the only indigenous trees. The deodar was found on both banks of the river, being most abundant on the left. The forests were more extensive than those on the Ravi, and more uniformly composed of deodar than any others Cleghorn had seen in the Kohistan of the Punjab; the trees grew in many places close to the river, but were generally of smaller size than those on the Ravi.

The quality of the Pangi deodar timber on the Chenab had been the source of much discussion, and there was a considerable correspondence extant at the time on the subject. It was generally admitted to be inferior to that of the Ravi, the inferiority, Cleghorn considered, arising from the peculiarity of soil and elevation, and perhaps also to the configuration of the valley. In the valley of the Ravi the river flows at an elevation of 4000 to 5000 feet, and the trees grow on precipitous crags over the tributaries 2000 feet above the main stream. In Pangi, the river bed is 7000 feet high, and the trees are often found close to the Chenab, in narrow gorges and without free circulation of air. At Sanch nullah Cleghorn observed a large number of trees with unhealthy bark, apparently caused by crowding and excess of moisture; "this, however, is a solitary case, and much deodar is of the finest quality. Moreover, in the early years of the Agency, trees may have been felled at the wrong season, and the wood may have been immature. As the felling has extended up the valley and to a greater elevation, the wood procured is of a better quality."

The Pangi timber had been used very extensively for various purposes in the Punjab during the ten years previous to Cleghorn's visit. That there had been considerable uneasiness felt as to its quality is evidenced by the correspondence on the subject and by experiments carried out in this connection by Captain Dyas, Director of Canals, Punjab. Dyas wrote: "I tried some experiments upon the timber from the two rivers. The Chenab wood was perfectly clean and sound from

Pangi; I also obtained some of the best procurable timber at Amritsar from a Ravi timber merchant, to compare with the Chenab wood. The results of the experiments are as follows :

MEAN RESULTS.

Description of Timber.	Dimensions.			Breaking weight.	Ditto reduced to units of L. B. D. 1 ft. 1 in. 1 in.	Weight in lbs. per cubic foot.
	in.	in.	in.			
Chenab deodar .	18	1½	1½	1348 lbs.	599 lbs.	28·62
Ravi deodar .	18	1½	1½	1821 lbs.	808 lbs.	35·75

"The constant for transverse strength obtained by experiment at Rurki for the Chenab timber was 583 lbs., which, it will be observed, agrees very nearly with the constant obtained by the experiment at Madhopur, viz. 599 lbs. The weight per cubic foot, however, varies considerably. At Rurki, the weight of a cubic foot of Chenab timber was found to be 23·06 lbs., at Madhopur it was 28·62 lbs. The Superintendent of the Panghi Timber Agency lately informed me that he had found the weight of a cubic foot of the Chenab deodar to be 16 seers or 32 lbs. I lay some stress on the subject of weight, because, of the same species of seasoned timber, that which is heavier is also stronger and more durable."

In a previous chapter (p. 272) allusion has been made to the establishment of the Timber Agency on the Chenab in 1854. Lieutenant Peyton was in charge of the Agency in 1858, being succeeded by Major Thomas in 1859, and by Mr. Smithe, as Superintendent of the Ravi and Chenab Forests in 1862, Mr. Murray, who had already served for a year in Panghi, being appointed as Upper Assistant.

Before the appointment of Major Reid as Superintendent of Chamba, in 1863, the great defect in the forest operations in the State was the total absence of all supervision over the work carried out. The numerous contractors worked without any system, and in a desultory fashion. They commenced each season by presenting the Rajah with a nuzzur (present), and so ingratiated themselves with him, according to Oriental custom. But with no record of the fellings kept, no one could tell whether 500 or 5000 trees had been cut during a season. The result was that the forest had become seriously depleted. The Rajah, growing alarmed at the evils and, more important

from his point of view, the serious consequences of the reckless system of exploitation, had welcomed the appointment of a Superintendent. Records were instituted in which all trees felled were entered, and a check introduced on the work in the forests. The only native contractor, outside the Agency itself, at work on the Chenab, had been carrying out operations for three years, and had sent down the river a large amount of timber. He paid nominally Rs.5 per tree, but as the stumps were not counted it is more than probable that the actual rate was much lower.

Cleghorn advised that the traders should be encouraged to buy their timber at the depôts, the actual work in the forests being restricted to the Agency Staff, saying that "in the deep chasm rivers of the Himalaya, competition is impossible, and one party alone can work ; divided interests lead only to wrangling and endless disputes."

Interesting details are given on the forest establishment of the Agency, on the working season, and collecting and hutting of the working gangs and their provisioning—the latter a matter of some difficulty owing to the absence of any good lines of communication. Before the establishment of the Agency, in 1862, the men were fed by the Rajah at such rates as he pleased to charge them. That arrangement was inconvenient and led to great discontent. As the valley did not produce food beyond what was required for its inhabitants, the officers of the Agency decided to import food from the adjoining villages of Padar, Seul and Kulu, a system which worked well. The food was sold at cost price, the carriage being debited to the forests. Curiously enough epidemics amongst the men were unknown till 1863, when small-pox appeared in the camps ; but "cases of dysentery and accidents occurred every season. The services of a medical subordinate would," said Cleghorn, "be especially valuable. For two years a native doctor, on Rs.40 per mensem, was very useful in Pangi ; the hardships of a forest life were, however, distasteful to him, and no successor has been found."

In 1861, 850 ; in 1862, 1018 ; and in 1863, 1897 men were employed on the work in the forests.

From Longden's enquiries, corroborated by Murray, one man felled on the average, during the season of six months, twelve trees, converted them into logs and launched them into the river. The rolling of the logs was the most difficult part of the work, increasing of course with the distance from the

river. The whole of the work was done with the axe, the use of the saw being unknown at that time in the valley, and the introduction of trained sawyers would, said Cleghorn, "at present be very costly, if expedient." The wood-cutters provided their own axes, but a small store of tools was kept to replace damage. The workers were paid for felling, rolling and marking logs at the following rates, which were in force in both the Ravi and Chenab :

	Haths.				
	5-6½.	6½-9.	9-11.	11-15.	Above 15.
	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs.
Felling and cutting into logs	0 12	1 0	1 2	1 8	2
Rolling into the river	1 4	1 8	1 14	2 8	3
Marking 100 logs	3 0	..	..	..	..

A hath = $1\frac{1}{2}$ feet.

No trees were now allowed to be felled under 6 haths, or 9 feet, although formerly they had been felled below this standard. When logs were broken 5 annas were deducted from the above payments, and fines were imposed at the discretion of the Agent for felling undersized trees. A great difficulty experienced at the time was the absence of a small silver coin in the currency of the district ; this want resulted in disputes and great inconvenience, and necessitated the carriage of excessive amounts of heavy copper. "Between Chamba and Kilar," wrote Cleghorn, "a distance of 180 miles, there is not a village where change for a rupee can be procured."

Longden had reported that a log was received at the dépôt ten or twelve days after launching, but he worked lower down in the valley, and few, if any, logs launched in August in the years 1861 and 1862 reached Sealkote the same year.

On the Chenab the work was being carried out in six districts : Durwas, Kilar, Sanch, Shor, Tindi and Lahul. In 1861 there were 50, and in 1862, 53 galls, 36 of the latter being first class, 11 second and 6 third ; showing a far greater proportion of first-class galls here than on the Ravi, the amount of breakage of timber being correspondingly less, averaging 5 per cent only.

Out of the 13 galls in the Durwas District (14 miles in length) half were first class. Upwards of 2600 trees were felled in

1862. About 2000 full-sized trees remained in three of the first-class galls, 500 in one of the second, and a few only in the third class. There were also 10,000 trees under 4 haths in girth. Two of the first-class galls were exhausted, containing only immature trees. This district was favourable for planting, the galls being open, generally good and close to the river.

The Kilar District extended for 18 miles on both banks, and is rocky and precipitous. There were 2 first-class galls, the other 4 being second and third class. Four thousand trees were felled in the district in 1862, a large number of them from third-class slides, which had been improved by making bunds across at intervals to arrest the velocity of the logs, the breakage before this check was instituted being extremely heavy. Checks of this nature would become necessary, said Cleghorn, in a large number of the slides, as the trees became exhausted in the more accessible places.

"Time, labour, money and superintendence are required, without these timber will not be procurable." About 2200 mature trees remained available for felling in the different galls, and about 10,000 others, of which a third only had barely reached felling dimensions, were situated favourably for subsequent cutting.

The Sanch District, 30 miles in length, contained 6 galls, all first class. Upwards of 2000 trees had been felled, one gall yielding half the total. About 4000 remained of cutting size, but in such difficult situations that the district should not be worked till more accessible areas had been cut out. About 5000 immature trees existed in this district.

The Shor District, extending 40 miles, had 14 galls, of which 8 were first class. The galls were good for launching purposes, but the forests were separated at a great distance from each other. About 1700 trees remained fit for felling, and there was much undersized timber. The small plantation of deodar made by Longden in 1853 (p. 269), in this district on the river bank between Rai and Sanch, contained 1000 promising young trees, "the known age of the plants will afford useful data as to rate of growth."

The Tindi District was small, the trees being much scattered. There were 11 first-class galls and one second. The district yielded 2000 trees in 1862. About 2000 trees of felling size remained.

In Chota Lahul there were two first-class galls. About 100 trees were felled in 1863. Fifty pencil cedars (*Juniperus*

excelsa) (*macropoda*) were felled, and about 500 remained. They were of small size, all the large trees being decayed in the centre. Terraced cultivation between the river and forests interfered with the launching of the logs. Logs of greater length were brought down the Chenab than by the Sutlej, Beas, or Ravi. The largest proportion of timber had been cut expressly for railway sleepers (12 feet); but a considerable number of logs 18 to 20 feet in length, had been launched; even longer logs could be sent down, if required for particular purposes, but an additional rate would have to be paid, as the larger timber would be harder to deal with in every way.

The Forest Officers, Cleghorn suggested, would have great opportunities of obtaining useful information on the subject of the different routes and passes into and out of Pangi and the Chenab Valley, and should be able to collect much knowledge of the Mid-Himalaya, which would prove very useful. The communications in Pangi were, he said, very bad, consisting of narrow tracks running along the mountain-sides on either bank. "Many parts overhanging the river are almost impassable for a laden man, and between Salgrain and Madgrain especially, the difficulties are such that even dogs and unladen sheep must be carried. This prevents the importation of supplies from Kulu, and obstructs all trade along the river bank. . . . An excellent riding path extends to the boundary of British Lahul, and if the bad places in the Pangi tracks were improved so as to be passable for mules, the rich valley of Padar would be connected with Kulu." From Triloknath to Darwas the river was spanned by ten bridges of the Himalayan type, made of birch or witch-hazel twigs, situated at Soorj, Kilar, Kagul, Mundlah, Sach, Kotul, Raie, Purtie, Shor and Tindi. Three of these on the main track were maintained by the Rajah, the other seven having been erected for forest purposes. It was arranged at this period that jhulas and bridges should in future be renewed by the Rajah, in consideration of the enhanced royalty paid on the timber. If repairs or reconstruction became urgent the Forest Officer was to have the work done, and the Rajah's account be debited with the amount.

A superior sangla or bridge, with close wattling of wicker work, had been built at Kilar by Murray, in 1863, over which laden sheep and goats could cross the Chenab. There was also a wooden sangla at Triloknath. The carriage of letters had up to this time proved an expensive and precarious

business, but it was now arranged that the Rajah's dâk runners (postmen) should carry letters to the Forest Officers every second day. The new arrangements for the working of the forests, although the excessive felling was still being maintained, were a considerable improvement on the old.

It has already been shown (p. 272) that some 16,000 odd trees were felled in Pangi between 1853 and 1856. In the two following Mutiny years no fellings were undertaken. In 1859, 5987 trees were felled; in 1860, 4872; in 1861, 11,197; in 1862, 12,513; and in 1863, 13,000; and in 1862-3, by a native contractor, an additional 10,000 (estimated). This gives a total of 73,728 trees felled between 1853 and 1863, inclusive. These were all first-class trees "of which," wrote Cleghorn, "this range can only supply 5000 to 6000 a year. It is obvious that no forest in the world can bear such heavy successive cutting."

The Forest establishment in Pangi at this period consisted of the First Assistant, Murray; 17 munshis (one in charge of each gang of workmen, whose duty it was to measure the trees and keep a return of the work done); 44 chuprassis or peons (to see the logs properly marked, launched, and note the amount of breakage); 1 treasurer; 1 native doctor; and a jemadar and six men to act as treasure guard.

Logs of the following species of trees had been cut and floated down the river, in response to the request of different public departments, indicating that even at this period there was some demand for species other than deodar; or that enough of the latter timber could not be obtained to fulfil all requirements. The following table shows the species brought down and the number of logs, in 1862 and 1863:

Species.	1862.	1863.
<i>Juglans regia</i> , Walnut . . .	logs 207	25
<i>Fraxinus sp.</i> , Ash . . .	„ 253	222
<i>Juniperus excelsa (macropoda)</i> , Pencil Cedar	„ 150	..
<i>Acer sp.</i> , Maple	„ 28	33
<i>Prunus padus</i> , Bird Cherry . . .	„ 23	2
<i>Betula Bhojpatra</i> , Birch . . .	„ 3	57
<i>Ulmus sp.</i> , Elm . . . .	..	128

Previous to 1862 there had been little demand for these woods. Cleghorn was unable to estimate the abundance of

these species at this period, as his attention was mainly concentrated on the deodar. But species of the timbers procurable in Pangi and Lahul had been deposited in the Madhopur workshops, and a set had been sent to the Punjab Exhibition.

Two maunds (160 lb.) of deodar seed and one of large ash were collected for sowing in suitable localities.

British Lahul was a mountainous tract contained within the angle formed by the rivers Chandra and Bagha, but extended down twenty-five miles below their junction at Tandi. The district divided Kulu from Ladak and Tibet, resembling the latter in character. It contained few indigenous trees. The *Juniperus macropoda* (the "shukpa" of Lahul and "lewar" of Kunawar) was the chief tree. It formed small forests, especially on the southern slope of the hills, at an elevation of 9000 to 12,000 feet. The trees seldom attained 30 feet in height and 6 feet in girth. Thomson (*Travels*, p. 257) mentions "one perhaps 40 feet high," and Cleghorn measured one below the monastery at Kyelang, 13 feet in girth. The bark is red, separating into *laminæ* like birch, "and apparently a good material for brown paper." The wood was used for house and bridge building. Of this tree Jacquemont wrote (*Voyages, tome 2*, p. 373) "C'est là qu'on fait avec le bois de *Juniperus arborea* les seaux, les vases de toute espèce, qui servent à contenir l'eau et le lait en Kumawar, et qui s'ex-portent en Ladak et à Garou."

The *Pinus excelsa* is the largest tree in Lahul, but is less common than the pencil cedar. About three miles above the junction of the two rivers (on the Chandra) there was a forest of this tree and a small patch above Kardang. "These two tracts had been thinned of late years," said Cleghorn, "and measures should be adopted to preserve the scanty arboreous vegetation of Lahul, where traders to Ladak experience so much difficulty in obtaining necessary fuel."

The birch, willow (*S. alba*), planted round every village and along the water courses, the slender branches and leaves serving as food for sheep and goats, and two species of poplar also planted near villages, but to a less extent, also existed. The birch is usually a crooked and stunted tree, sometimes exceeding one foot in diameter. The annual bridges built, or "slung" would be the more appropriate term to use for these contrivances, over the mountain torrents, were made of birch twigs; and the bark was used, instead of paper, for the draft forest returns!

Cleghorn remarks that the Lahul villagers had quickly learned to appreciate the value of the potato, Raleigh's great gift to the Old World having at length penetrated to this remote region, and eagerly applied for seed.

The adjoining district of Spiti was not visited by Cleghorn, but it is even more barren than Lahul, the arboreous vegetation consisting of only a few willows and poplars growing in ravines on the banks of streams.

An arrangement was come to on June 24th, 1864, between the Chief Commissioner of the Punjab and the Maharaja Golab Sing, of Kashmir, that in future the Agent would require no assistance of any kind from Kashmir officials (there having been friction on this score); but that at the same time the British Forest Officers were at liberty to employ any Kashmir subjects who might seek employment under the Agent of their own free will.

The portion of the Chenab River, about 200 miles in length, which passes through Kashmir territory, and down which the Chamba logs had to float, was but little known at this time. Longden had apparently followed the course of the river from Pangi to Sealkote, but left no account of his journey. A munshi was sent from Pangi in October, 1862, to inspect this portion of the river, in order to ascertain where the timber became stranded; he counted upwards of 31,000 logs, and said that in many places there were piles of timber difficult to reach or to count. The great discrepancy between the number of logs launched and received at the dépôt in 1862 caused Cleghorn to be extremely desirous of ascertaining the amount and position of this stranded timber. He was able to secure the information so desired through an adventurous journey down the river bank made by Lieutenant Chalmers and Mr. Murray, undertaken in November, 1863. These officers had been detained in Pangi by a snowstorm, which prevented them from crossing the Sach Pass. They therefore marched down the 200 miles of river, from the Chamba boundary through Kashmir, eventually arriving at Riasi on the southern Kashmir boundary and British territory. On this journey they counted 49,000 stranded logs, 39,000 of which were 1863 season logs. They noted that some logs had been tampered with, the Maharajah's mark being substituted for that of the British.

The length of the Chenab between Riasi and Rammuggur, a tract 100 miles long, formed the Lower Sub-Division of the

Agency in charge of an Assistant. It included the district of Bajwat, which is intersected by numerous streams. The Assistant's duties consisted in catching logs in the floods, clearing numerous islands of stranded timber, controlling the establishment in the summer, and in the winter months selecting, allotting and invoicing the timber, all of which afforded ample occupation.

The following statement of the amounts of timber supplied to the different Public Departments of Government during the three years, 1861-2 to 1863-4 (the latter for six months of the year only), is of interest as evidencing the great demands which were being made upon the forests at this period :

Departments.	1861-2.	1862-3.	1863-4.
Punjab Railway Company . . .	4,59,744	3,91,890	1,00,517
Executive Engineer, Amritsar . .	..	31,041	..
" " Lahore . . .	16,622	..	..
" " Lahore and Pesha-			
war Road, 1st Division . . .	..	..	9040
Executive Engineer, Lower Canals . .	2665	..	..
" " Multan . . .	..	..	4526
" " Sealkote . . .	11,934	4735	15,617
Harbour Works, Karachi . . .	35,180	..	5642
Boat Bridges (Deputy Commissioners) .	14,779	3893	16,701
Civil Works ditto . . .	14,419	5071	5497
Private Parties	32,132	1,02,241	95,300
Total cubic feet . . .	5,87,475	5,35,871	2,52,840

The rates for timber issued from the Agency, sanctioned in 1862, were as follows :

Up to 12 feet long 4 cubic feet per rupee I

12	"	20	"	"	3	"	"	"	I
20	"	30	"	"	2·5	"	"	"	I
30	"	40	"	"	2	"	"	"	I
40	"	50	"	"	1·5	"	"	"	I

Timber was not procurable above 50 feet.

These rates applied to all purchasers and were low, says Cleghorn, so that the purchase of timber at the dépôt and its resale at Stations, etc., proved a profitable business.

Orders were issued that every assistance should be afforded to the Punjab Railway Company, and that all delays in measuring or removing wood should be reported. The follow-

ing amounts of timber were supplied to the Agent of the Railway and his contractors :

1859.	1860.	1861.	1862.	1863 (six months).	Total supplied during five calendar years.
cubic feet. 29,124	cubic feet. 1,00,794	cubic feet. 3,05,173	cubic feet. 5,30,625	cubic feet. 1,60,064	cubic feet. 11,25,781

Cleghorn states that the chief purposes for which timber was required by the Ordnance Department was for shafts, wheels of carriages, platform planks and sleepers, ammunition boxes, helvæs of tools, musket-stocks and plugs for Minié rifle balls. For shafts, ash was suitable ; for felloes, babul and oak ; for spokes, babul ; for navæs, sissoo and elm ; for platforms, deodar ; for ammunition boxes, elm ; for musket-stocks, walnut ; and for helvæs, ash and daman (*Grewia tilioefolia*).

Cleghorn incorporates in his Memorandum on the Chenab Forests and operations the Rules of the Pangi Timber Agency and the Report of the Superintendent on the work of 1862-3. The year's floating operations had proved difficult, owing to the fact that the cloudy and misty weather up in the mountains had delayed the melting of the snows, thereby lessening the amount of water in the river during the season, the great decrease in the usual volume of snow water not being made up by the rainfall which had been experienced. In consequence the greater bulk of the logs of the season had not reached the depôts, the greater part of those arriving being of previous years' launchings. As the logs were not given a distinctive mark each year it was impossible to distinguish one year's launching from another, or to accurately estimate the percentage of loss of logs in transit. There were other deficiencies in the Report as to amounts of timber still on the river and in the depôts compared with the figures given of fellings in the forest and the launchings. But the Report showed the great advantage of the new system of working. Brandis, in reviewing the Report, says :

"The low cubic contents of the timber forming the balance in hand at the end of each year deserves notice.

The logs received in 1861 measured . . .	22.27	cub. ft.
Those remaining on 30th April, 1861 . . .	11.98	"
The logs received in 1862	18.19	"
Those on hand at the close of the year . . .	13.04	"

It is evident that in both years the best timbers at the dépôt were picked out and sold, and the smaller timbers left. If these can be disposed of at the same rate (the returns in the Report took the average value of the logs on hand in the dépôt at the end of the year as the average value of the logs disposed of) as the large logs, there is no harm in this selection, but the accumulation of small logs should be avoided. It is supposed that purchasers are to a certain extent permitted to select their timber."

Cleghorn concluded his valuable Report on his examination of the Chenab River Forests and operations as follows :

"The Pangi Timber Agency has effected the desired object in bringing down a larger and better supply of timber than formerly. Previous to its existence, public works were often stopped for want of timber, which was scarce and high-priced. In 1861-2 four and a half lakhs of cubic feet of deodar were issued to the Punjab Railway Company, and 60,000 cubic feet to different officers of the Department of Public Works ; this quantity being twice as much as was brought down the Chenab by all the native traders during the same year, and sold at half the price. In 1862-3, nearly five lakhs of cubic feet were supplied to the Punjab Railway Company ; and 40,000 cubic feet to Government officers. Various hard and fancy woods have been procured, and something has been done to restore the forests by planting which should be systematically carried out if a long or perpetual lease can be arranged."

"The financial result is favourable. The sales of the last two years are given below :

	1861-2,	1862-3.
Sales of Timber . . .	Rs.1,31,823	Rs.1,45,384
Whole Expenditure, establishment, labour, etc. . .	1,08,790	1,07,126
	Rs.23,033	Rs.38,258

It is proposed to erect a saw mill at the head of Bajwat Island, and the scheme has received the sanction of the Government of India. Great advantages will result from sawing up the timber as it enters the plains. From the commencement of the Agency the chief timber dépôt has been at Sealkote. But circumstances have changed. The demand for wood at that station is now small, and Wazirabad is certainly the most convenient locality, the Lahore and Peshawar road

affording great facilities for transport. The dépôt has accordingly been removed to that place. The river becomes navigable for rafts at Aknur, fifty-three miles above Wazirabad, and down to its junction with the Gara (300 miles) no obstacle to navigation occurs. The demand for boat-building materials is increasing."

THE VALLEY OF THE JHELUM RIVER

The Jhelum, the westernmost of the five great rivers of the Punjab, takes its name from the town of Jhelum. It drains the valley of Kashmir, and flows through the Pass of Baramula in the lofty range of Pir Panjal. Its tributaries, including the Jhelum proper, are the Vesha, Sind, Kishenganga and Kunihar or Nainsukh. The mountain course of the river in Kashmir is about 380 miles, with a fall of about 8000 feet to the Kashmir Plain, where the river becomes slow running. Its length from the foot of the hills to its junction with the Chenab is about 280 miles.

The Jhelum River is the Hydaspes of the old Greek historians. Both Arrian and Strabo record that Alexander the Great was supplied by this river with wood from Kashmir, of which he constructed boats. Strabo, *Lib.*, XV, p. 480, says :

"Alexandrum, ait, in sylva montium emodorum multum abietem, pinum, cedrumque, aliasque arbores navibus compingendis idoneas, cædi jussisse atque in Hydaspem, deduxisse, equibus classis constructa sit."

Kashmir is well known to many nowadays, and is famous for its great beauty. But at the period at which Cleghorn visited the Western Himalaya and wrote his Report there were no records descriptive of the timber resources of the Kashmir Valley, although much valuable information was to be found scattered through the works on the travels of Vigne, Von Hugel, Jacquemont, Thomson and Moorcroft, the observations of the last two perhaps being the most informative. Sir Henry Lawrence had accompanied the Maharajah Golab Singh, when the latter went up to take possession of Kashmir after it had been ceded to him in 1846. For those unacquainted with Kashmir it may be said that this Native State consists of an extensive plain or valley, with broad sheets of water favouring a rich cultivation by an abundant population, surrounded on all sides by lofty mountains. The State forms the upper part of the basin of the Jhelum, and is separated from the valley of the Chenab on the south by the rugged and often snowy

ranges, and from the basin of the Indus on the north by the main axis of the Western Himalaya. The mountains on the north are for the most part bare and rugged on their southern face, while those which lie to the south appear from the plains to be magnificently wooded with forests of pines and deciduous-leaved trees descending almost to their base (Thomson). Kashmir is traversed in its whole length by the Jhelum, which rises at the east end of the valley and winds through the plain, at one time washing the base of the northern hills, at another receding to a considerable distance from them. The stream is tranquil and slow in the plains, and navigable for boats of considerable burden throughout the whole length of the level country as far up as Islamabad. It was consequently at this period a great highway for traffic, and wheel carriage, in spite of the fact that the country is perfectly level, was unknown. The stream is small at Islamabad, but through tributaries, it enlarges, till at Srinagar it is 50 to 100 yards across and often very deep. The elevation of the bed is 5300 feet.

The deodar was abundant and was extensively used in the construction of houses, temples and bridges. The forests also contained *Pinus longifolia*, *P. excelsa*, silver fir, walnut, maple, poplar, willow, yew and a species of juniper. The "chinar" (*Platanus orientalis*) or oriental plane, "though not indigenous," wrote Cleghorn, "is probably found nowhere more abundant or luxurious. The absence of oaks, rhododendrons, *Andromeda* and *Pinus Gerardiana* is remarkable."

On his accession Golab Sing, the then Maharajah, monopolised the timber trade, and the price of wood then was double what it had formerly been. The only kind of wood floated down the Jhelum was the deodar. As soon as the snow melted it was floated down the various streams, collected by the Government and sold at Jhelum. It was calculated that the average annual supply was about 2000 logs (exclusive of the British timber from Kaghan), some of the logs being 50 feet in length.

By orders of the Mogul Emperors, a grove of chinar and poplar was planted near every Kashmir village; these were protected by a heavy fine on every tree felled, but the Sikhs destroyed many of them. "Extensive groves," says Cleghorn, "of mulberry trees, planes and poplars, elms and willows, still constitute one of the greatest beauties of the country, and give an European aspect to the scenery."

The instructions of the Lieutenant-Governor required Cleghorn to visit the forests of Kaghan along the banks of the Kunihar or Nainsukh, the only tributary of the Jhelum which he personally explored. The deodar forests in Kashmir above the confluence of the Kishenganga and Jhelum proper still remained, he said, to be examined.

CHAPTER XXIII

FOREST OPERATIONS IN THE PUNJAB, 1858-1864 *(continued)*

THE FORESTS OF THE FRONTIER

IT has been deemed advisable to deal with Cleghorn's visits to forests on the Punjab Frontier in a separate chapter. His Report on this region indicates the lines upon which they were being exploited and treated by the Frontier Officers at this period, in addition to affording valuable information on their condition at the time.

The regions dealt with are the Kaghan, Hazara, Murree Hills and Rawal Pindi District; and a valuable Memorandum on the timber procurable from the Indus, Swat and Kabul rivers.

A great deal of interesting information, which is outside the purview of a history of the forests, is given (as demanded by the instructions of Government to Cleghorn) on the agriculture, orchards, flora, especially from a medicinal point of view, and so forth, of the areas visited. It is with regret that these details, exhibiting so clearly the remarkable powers of observation, scientific knowledge and energy with which Cleghorn was endowed, cannot be incorporated here. Allusion is made to them, however, as they exhibit in the most striking manner the lines upon which British administration, even in the wild frontier districts, was now being carried on; and with what devotion and self-sacrifice the British officials were throwing their whole hearts into ameliorating the condition of the people and bringing so far as possible order and the *pax Britannica* into regions which had known no orderly regime through the centuries. Those who ask what the British have done in India and for India can find their answer in Cleghorn's remarkable Report of what was being accomplished on the Punjab Frontier sixty years ago.

The valley of the Nainsukh or Kunihar is about 120 miles in length, from the source of the river in the Lalusar Lake to its junction with the Jhelum, the general course of the river being south-west. From the junction up to Balakot the valley is open and of considerable breadth, the lower slopes of the hills at this period being either bare or with scattered *Pinus longifolia* trees, while on the northern aspects of the summits were deodar and silver fir. Above Balakot the hills close in, and the mountain-sides are in many places very precipitous. A path along the bank of the river had been made some years previously by Colonel J. Abbott, and more recently this had been improved by Lieutenant H. Blair, R.E., to facilitate the passage of laden mules. The Kaghan Valley, at the time of Cleghorn's visit, had not been surveyed by the officers of the Great Trigometrical Survey, but was shortly to be brought within the triangulation. The only maps of this region in existence were a survey sketch of the river from its source at Garhi Habibulla Khan, by Captain Nightingale, 1853 ; and a military sketch of part of Kaghan, by Major Lumsden, D.Q.M.G.

On ascending the valley, Cleghorn met the first deodar, a clump of small-sized trees, before reaching Kawai. A few miles further up, from the village of Paras up to Narain, the northern slopes of the mountains were covered at intervals with fine deodar forests usually mixed with blue pine. Above Narain the deodar became scarce and more stunted, disappearing altogether at the source of the river. The positions and extent of the patches and forests of deodar, which lay adjacent to the river and its two chief tributaries, some thirty in number, were entered by Cleghorn on Nightingale's survey sketch.

Felling in these forests had taken place chiefly between Paras and Jereid, and much outlying timber had been left by contractors. The average dimensions of the mature trees was much smaller than in the forests of Chamba and Bushahr ; about 9 to 10 feet in girth, 4 feet above ground-level, on a full average. A few specimens of giant growth were seen, but these were exceptional, and the size diminished in the higher part of the valley. The whole valley was British territory. The Syed and Swati proprietors received a half share of the former royalty, which was Rs.1.8 per tree ; the rate had been recently raised, but the royalty paid remained 12 annas per tree. The existing rate per deodar was Rs.5 per tree in Hazara and Rs.2

in Kaghan. Cleghorn was consulted by Major Adams, the Deputy Commissioner, on the advisability of raising the rate in Kaghan, as the value of wood in the plains was increasing. The former thought that Rs.3 would be a fair average price, taking into consideration the size of the trees and the difficulties of transport.

After visiting the whole valley and ascending two high spurs from which a full view could be obtained of the two principal tributaries (Bhunja and Mannur Kus), Cleghorn expressed the opinion that as a *maximum* 1000 deodar trees could be felled per annum without permanently injuring the forests. Captain Melville, of the Great Trigonometrical Survey, informed him, a statement confirmed by Mr. T. Arratoon, who was well acquainted with the deodar forests of the whole of the Punjab Region, that a large area of deodar forest existed above the junction of the Kurna River, only separated from the Nainsukh by the Kaghan Range, and also in the side valleys from the Kashmir Range. These tracts were in the Maharajah's dominions.

At low water the breadth of the Kunihar at Garhi Habibulla Khan was about 70 feet, and the depth in midstream 3 to 4 feet. The current during floods is very rapid. Cleghorn thought that up to Jerieed no serious obstruction to floating logs of moderate length, 12 to 14 feet, was to be anticipated, and in this respect the river in this stage was more favourable than the Upper Ravi. About six miles below Kaghan the river bed became tortuous and blocked with large boulders, and "as had been observed in other rivers, the best pieces of forest are ever in the obstructed places. The Syeds state, apparently with truth, that it is only at the highest flood that logs are carried over these rocks and then with considerable damage."

Allusion has already been made to the earliest records of the forests of this region (p. 270), Colonel Abbott having been requested in 1852 to endeavour to get timber down the Kunihar River to Jhelum. The attempts made to carry out the order failed. Adams made two efforts in 1860 and 1861, which were partially successful. He arranged with the maliks (village headmen) for the felling of a thousand trees and the launching of the logs, which were not less than 25 feet in length, while Major Robertson maintained during the floods a gang of taroos to land them at the dépôt at Jhelum. Eighteen hundred logs were launched in the river; of these 1500 passed

Balakot, and 900 were landed at Dangalli, the remaining 600 being appropriated as drift timber by the Maharajah of Kashmir, the marks being obliterated. Including all losses the timber secured was regarded as cheap! A sufficient commentary on the great demand which existed at the period in this region! Cleghorn expressed a high opinion of Adams' management of the Hazara Forests, which had been "careful, judicious and progressive."

Several contractors from Rawal Pindi had purchased trees in the Kaghan Forests and, as they had recently lodged money for a second supply, Cleghorn assumed that the speculation had proved remunerative. They all reported that the extraction of the timber was most difficult (a common enough complaint of timber contractors however, though in this instance doubtless justified), and though the length of the logs had been reduced to 10 to 12 feet, about 300 from the former operations were still stranded on the river banks. The mule path opened by Lieutenant Blair from the Balakot thanna (police station) through the lower forest had been carried as far as Jereid. There was an iron suspension bridge at Garhi, and wooden bridges at Balakot, Jereid, Kaghan and Narain.

The forest operations in this region had for political reasons remained under the Deputy Commissioner.

As a special case, Blair, who was in charge of the road-making work and was very popular among the Syeds, was requested to repeat Adams' experiment and have felled 800 trees (say 2400 logs), and also to remove all the felled timber lying in the forests. Much timber was required at Abbottabad for various works, and the surplus, if any, would be available for railway purposes.

Blair superintended the fellings in Kaghan, whilst Captain Strutt watched the arrival of the logs at Salgrain, and rafted them to Jhelum. The personal superintendence of this work by these two officers achieved success and the logs realised a profit; and during the operations convictions were obtained against several persons arrested for timber stealing.

Cleghorn stated that the best season for felling here was the cold weather, November to March, the people not being engaged in agricultural work at this period. The river had already a considerable volume of water in it in April as a result of the melting of the snows, which commenced in the Kaghan

Mountains in March. In order to get the timber down in the first floating season after it was felled Cleghorn considered that early launching was imperative. With the thanna now in existence at Balakot at the mouth of the glen effectual supervision could be kept on attempts at timber stealing, there being no outlet for the timber save down the river. The chief loss and difficulty hitherto had been during the transit of the timber down the Jhelum, and on this length strict surveillance was necessary to prevent the surreptitious removal of the logs. No difficulty was to be feared on the score of the labour supply. Kashmiri labour was abundant, and the Syeds were ready and anxious to enter into arrangements for felling timber and putting it into the river.

Adams' recorded opinion on this subject was that "liberal payment and considerate treatment will secure labourers in Kaghan, through the Syed and Swati maliks, and the more use that is made of the maliks in carrying on forest operations the better." Food might be a difficulty, but in the event of its proving necessary to employ large labour gangs at any time this could be imported, as was done in Pangi.

The Political Officer had already realised, even in these early days of our occupation of the Frontier, that the best method of weaning the tribesmen from their ordinary occupation of raiding and theft was to afford them facilities for engaging in more peaceful and lucrative work.

Cleghorn gives a valuable list of the plants, including trees, he observed in Kaghan. In addition to the deodar, he reported there was much *Pinus longifolia* and blue pine; also crab ash, olive, hazel, walnut, maple and hill toon (*Cedrela*); the rhododendron was rare. The size of the trees was less than in the valleys to the eastward. The large ash existed on the Thandiani and Mochpura Ranges, but was not found in Kaghan. The absence of oaks also, except *Quercus ilex*, of which a few trees occurred, he considered remarkable.

Cleghorn's summary on the forests of Kaghan is as follows:

(1) A large extent of deodar forest lies in the valley, but the supply of timber will not be great, as the river becomes almost impracticable for floating six miles below Kaghan village. The trees are smaller than in Chamba, but the quality of the wood is excellent.

(2) The best position for a dépôt is twenty miles above

Dangalli, in the Pindi District. Taroos are useless on the Nainsukh.

(3) A letter from the Punjab Government to the Maharajah of Kashmir requiring respect to be paid to the forest mark would be useful.

(4) A small establishment in Kaghan is necessary, say, one jemadar and four chuprassis (peons). The co-operation of the Deputy Commissioner, Rawal Pindi, is essential. The catching and landing of the logs requires much attention; the best system would be proved after one or two trials.

(5) The annual felling in Kaghan may be restricted to 800 deodar and a fair proportion of other trees. If a tramway or other public work should hereafter be undertaken, these forests will be of great value.

Dealing with the plains portion of the work Cleghorn stated that light rafting commenced about sixty miles above the bridge of boats at Oin, a village on the left bank where Arratoon formerly had a dépôt when he was engaged in timber extraction in Kashmir, and where the materials for boat-building were then collected. Dongalli, on the right bank, thirty-five miles from Jhelum, is the site of an ancient town, and was at this time the highest point at which large rafts could be formed. Materials for the requirements of Rawal Pindi were stored here, sawn planks being transported on camels or bullocks. At Dhuilial, eleven miles above Jhelum, there was a saw mill of simple construction which had been formerly used by the officers of the Lahore and Peshawar road. It had not been worked since 1856, but Cleghorn suggested that it might be put in order for cutting sleepers.

An annual tribute of 450 deodar logs was paid at Jhelum to the Maharajah of Kashmir. After selecting the timber required for repairs to the bridge of boats it had been customary to sell the remainder at current rates. The native merchants in 1863 sold deodar timber at $2\frac{1}{2}$ cubic feet per rupee. The Government sanctioned the following rates per cubic foot for the timber brought down from Kaghan, the logs being divided into five classes: 1st class, 8 annas; 2nd class, 7 annas; 3rd class, 6 annas; 4th class, 5 annas; and 5th class, 4 annas.

Besides deodar, *Pinus longifolia*, blue pine and "anundar" were obtained at Jhelum, the rates per cubic foot being

respectively 4 annas, 6 annas and 5 annas. Tun in smaller quantity was procurable; sissoo of fine quality was scarce, but the islands in the river were covered with young trees which promised well. An extension of planting on *belas* (alluvial land thrown up by the river) was most desirable. Splendid mulberry trees also grew on the islands, but most of them belonged to Kashmir.

With reference to Cleghorn's above-mentioned remark anent planting, Mr. Thornton had proposed a plan for planting up alluvial lands newly thrown up, where they promised to be permanent. This scheme was pressed upon local officers by the Financial Commissioner (Circular No. 13 of 1864). The following extracts from Reports on the subject are of interest:

The Deputy Commissioner, Jhelum, says, "including the islands of the river 66 acres of land have had sissoo seed, to the extent of 50 maunds, broadcasted over it, in the manner prescribed by Mr. Thornton, in one of his circulars, when Commissioner of this Division. Great success had attended this in some instances. On the island near Jhelum, the young trees of 9 years are 30-40 feet high, and average 6-8 inches in diameter. There is another grove in an alluvial deposit at Khoora, and a fourth on an island, Suggerpoor. At these four places there cannot be less than 100 acres of this most useful timber. I am yearly thinning out numbers of the trees, training them and fostering their growth, and with every success."

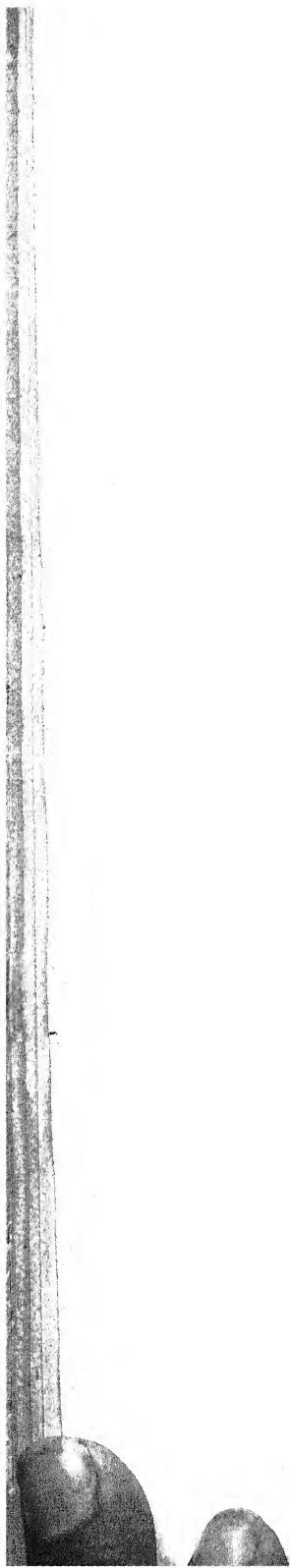
In Gujerat, the Deputy Commissioner reports, "about a lakh of young trees have been produced and planted out during the year, chiefly sissoo and siris (*Albizzia Lebbek*), which are best suited to the soil and climate of this district. I have considerably increased the nurseries formed on Bela lands, in the rivers, for the production of sissoo forests."

The flora of the Jhelum District had been carefully examined by Dr. J. E. T. Aitchison, his lists being published in the *Journal Royal Asiatic Society, Bengal*, 1864. The principal timber trees he enumerated were: *Zizyphus jujuba*, *Pistacia integerrima*, *Acacia arabica*, *Acacia modesta*, *Tamarix dicica*, *Olea Europaea*, *Capparis aphylla* and *Crataeva religiosa*.

Previous papers describing the Jhelum District were: "Camps and Battlefields of Alexander and Porus," by Captain Abbott, R.A.; "Diary of a Trip to Pind Dadan Khan and the Salt Range," by A. Fleming, M.D.; "Descriptive



MIXED FOREST OF *PINUS EXCELSA*, *CEDRUS DEODARA*, *PICEA MORINDA*
AND *ABIES PINDROW* (SILVER FIR), UPPER SIRAN VALLEY, HAZARA
From Trouph's "Sylviculture of Indian Trees"



Notice of the Jhelam District," by L. Bowring, B.C.S.; and "Report on the Geological Structure and Mineral Wealth of the Salt Range," by A. Fleming; published in the *Journal Royal Asiatic Society* for 1848, 1849, 1850 and 1853 respectively.

Cleghorn concluded his Report on these forests as follows : "The building of boats is much increased. There are two patterns, one full decked, the other half decked. Sissoo and mulberry are used for knees and bends ; the rest of the boat is generally deodar, but for the floor planking *Pinus longifolia* is preferred. Lieutenant Chalmers informed me that some boats were ten years in good order. The best oars are made of large ash. The navigation commences at Jhelum. The river skirts the salt range for a hundred miles, and we may anticipate a greatly increased traffic in salt, cotton and coal. Jhelum and Pind Dadan Khan are well adapted for fuel stations, having high banks ; the supply of firewood on the low hills is abundant ; we have no data of the yield and annual inspection is desirable."

THE FORESTS OF HAZARA

With the exception of Kangra and Hoshiarpur, Cleghorn states that Hazara was the only well wooded district of the Punjab proper. He considered it desirable, therefore, to give an outline, which is most interesting, of the progress of forest management in this district, adding : "this summary may prove useful to other districts in which the conservancy of forest tracts and jungles is being initiated."

It has been already shown (p. 274) that in 1855 draft Rules for the forests were forwarded by Mr. Temple, and an Annual Report called for. In 1856 Captain Becher, the Deputy Commissioner, reported the position and extent of the principal forests of the district, the care being taken of them and the royalty per tree charged.

In the same year the Commissioner, Sir H. Edwardes, forwarded a set of Rules, drawn up by himself and Captain Becher, which received the sanction of the Chief Commissioner in January, 1857. These Rules, with slight modifications, were in force at the time of Cleghorn's visit.

The Rules have already been quoted *in extenso* on p. 275.

Under the Rules two rangers were attached to each of the ten police stations,

The following is a statement of the Receipts and Expenditure for the years 1856-7 and 1857-8 :

RECEIPTS.		EXPENDITURE.	
	Rs.		Rs.
Seignorage or Royalty (minus the share paid to Zemin- dars) (two years)	992	Establishment . . .	867
1858.			
Seignorage or Royalty . . .	503	Establishment . . .	837
Balance of 1857 . . .	125		
	—		
	628		
			837

Captain Becher reduced the establishment by four rangers in March, 1859, as it appeared doubtful to him whether the forest conservancy would be self-supporting. In that year, however, a great demand arose for timber for house-building at the Murree Sanatorium and Haripur. Ash had been found useful for the shafts of gun-carriages, bullock-carts and the oars of boats, and timber was required for the erection of the lines, mule-sheds, etc., of the regiments stationed at Abbottabad.

Under written permits and after prepayment of fees, 1422 trees were felled, chiefly deodar, blue pine, *Pinus longifolia*, ash and walnut, and 812 bullies or saplings.

Consequently the receipts for 1859 amounted to Rs.1000, the expenditure to Rs.614, showing a balance of Rs.395. This was considered a good beginning, and there was reason to believe that a steady demand for timber would continue. Experience was also gained on the subject of the tracts most in need of supervision.

Up to this date, the timber was carried on men's heads along rude paths made by contractors. Transport was facilitated, however, by the construction of the military road from Murree to Abbottabad, via Dungagulli. When this road was opened to traffic the timber was carried from the forests of the Môchpura Range to the Dôr, near Dhumtour, down which it could be floated when there was a sufficient depth of water; or it was taken on to Abbottabad. Small timber cut in the Barangulli Range was also floated down the Dôr. The Kunihar (or Nainsukh) and the Jhelum unite at the northern end of

that range. From the Thandiani Forests, the new path opened out gave an outlet. Timber was carried down by men to Nuwashahur, from whence the road was practicable for bullocks, camels and even carts.

During 1860 the management of the forests progressed, some check having been introduced to former methods of wasteful and illicit fellings. A redistribution of the forest rangers was effected. Numerous applications for permits to fell trees were made, and 1193 deodar and 2371 other species of trees were felled during the year, a half share of the seignorage being paid to the landowner.

The receipts for the year were Rs.2331 and expenditure Rs.550, leaving a balance of Rs.1781. Out of this surplus Rs.700 was sanctioned for improving the forest track to Thandiani, above mentioned, which was a great boon to the locality, an offshoot being contemplated to tap the Turnawai Forests. This grant is an interesting recognition at that period that it was a sound economic principle to devote a part of the surplus revenue from the forests to their development by increasing facilities of transport and so forth.

Two head-rangers (jemadars) were now appointed on Rs.12 per mensem, the rangers drawing Rs.6 a month only.

In 1861 Adams reported increased demands for timber, and noted that with the formation of roads in the country in which some of the chief forests were situated supervision was easier, thefts less in number and the timber extracted with greater facility. Five thousand three hundred and seventy-three trees of all species were felled, chiefly in the Môchpura Range and in Kaghan. The revenue for the year amounted to Rs.3887, the expenditure (establishment, Rs.700; grant for roads, Rs.700; marking trees, etc., Rs.44) to Rs.1444, the balance being Rs.2443. Cleghorn adds that "for the first four months of 1862 the receipts were Rs.1346, and in the official year 1862-3, Rs.5665; the annual net revenue of the Hazara Forests may be considered about Rs.4000." This summary shows the progressive steps taken for bringing the forests of Hazara under supervision, and proves that an encouraging commencement has been made.

During his visits Cleghorn inspected the whole of the Môchpura Range; and afterwards ascended the Thandiani, descended to Mansera via Turnawai and traversed the Pukli Valley. He considered that if the Hazara Rules were carefully worked and amended as might become necessary, successful

conservancy might be expected. If the suggested operations on the Nainsukh succeeded he proposed for consideration the advisability of uniting the forests of Hazara with those of Murree and the Salt Range, forming one charge under the supervision of an Assistant Conservator of Forests. He recommended that the forest fund should be kept distinct, and that small grants be made to be expended in restoring exhausted deodar tracts, planting ash and toon, and so forth.

He agreed with Adams that the amounts paid in seignorage fees to the landowners were sufficiently high, the latter getting a half share, whilst in Murree they only received one-eighth. Therefore there should be no increase in the payments to landowners when the rates for deodar and other good timbers were raised by Government. This latter was subsequently done in 1862. The deodar was not abundant in Hazara (except in Kaghan). Cleghorn only observed it on the north side of the Môchpura Range, towards the Jhelum, and sparingly on Thandiani. The increased rates for this timber were put on with the object of checking fellings.

"The remaining trees," said Cleghorn, "should be allowed to stand for seed, and the timbers required be obtained from the Nainsukh at Garhi. Promising clumps of young trees should be protected from cattle by a fence."

Three points bearing on the forest management question were brought up by Adams: (1) The cultivation of potatoes, which was rapidly extending, as the crop yielded good returns. Forest land was preferred, but it was maintained that the finest pieces of forest should not be given up for this purpose. There was plenty of suitable land available without sacrificing any valuable timber. Woods containing deodar, ash and oak should be reserved. (2) The Himalayan oak (*Q. incana*), *Pinus longifolia* and the small *rhus* (*R. cotinus*) were employed for tanning. The oak when well-grown was a valuable tree, rather scarce in some parts; the other two were very abundant and of comparatively little use as timber trees at that time. The oak was, therefore, to be preserved, unless stunted, and the other two were allowed to be barked by the village shoemakers free of charge. (3) The burning of grass by zemindars and herdsmen was Adams' third point. He stated that it was a matter of difficulty to frame Rules sufficiently stringent to protect the forests, without these Rules in some degree proving harassing to the people. To this Cleghorn agreed and considered it best to leave it to the officer charged with

the conservancy arrangements to deal with each case as it arose, and to allow him a discretion to enforce or relax the penalties attached to breaches of the Rules. "The burning of grass within forests which yield deodar, blue pine and other valuable wood, or in places whence there might be danger of the fire extending to them, must be strictly prohibited, but I would not interdict it in those tracts which yield *Pinus longifolia* only unless they are upon the bank of the Jhelum or other navigable rivers."

THE FORESTS OF THE MURREE HILLS

In 1862 the sanatorium, as it was then termed, of Murree consisted of 112 houses, "situated most picturesquely," says Cleghorn, "on different heights and acclivities, many of them hid in forest verdure, others on naked points of rock." Murree is about 7300 feet up on the summit of a ridge at the western extremity of the Western Himalaya, overhanging the plateau of Rawal Pindi, which is distant forty miles.

The species of conifers clothing these hills are those common to the Western Himalaya. Cleghorn states that the wood of the blue pine is very superior and formed the chief material for house-building at Murree, the deodar not being abundant, and adds: "The wood of *Pinus excelsa* (the blue pine) is not valued at Simla. The difference in quality in the wood is remarkable, and may be attributed to the soil and climate, and consequent development of resin at Murree. The oaks present consisted of *Q. incana*, frequently forming fine forests on the northern slopes; *Q. laxiflora*, a magnificent forest tree seldom seen below 6000 feet or above 7500 feet, and *Q. floribunda*, a species far from common, the timber being very hard and much prized."

The following note is of interest:

"Around the limits of the sanatorium, for which compensation was paid, the area of forest tracts supplying timber and fuel is calculated at 11,000 acres by Captain Birch, but the whole area 'cannot be less than 200 square miles, of which half is cultivated,' the other half is available for pasturage and fuel. No reserves have yet been made, but Major Cracroft, Deputy Commissioner, well remarks, 'when a distinct mountain tract can be found of sufficient extent to be separately demarcated, it will be taken up.' This is of great importance for the interests of the general public, and special examination

is desirable for this purpose. The Assistant Commissioner, Murree, has an establishment of one jemadar and twelve chuprassis, at a monthly charge of Rs.68, who, if restricted to their special duties, should be sufficient to supervise the forests round the station."

The annual receipts and expenditure for 1861 and 1862 were as follows :

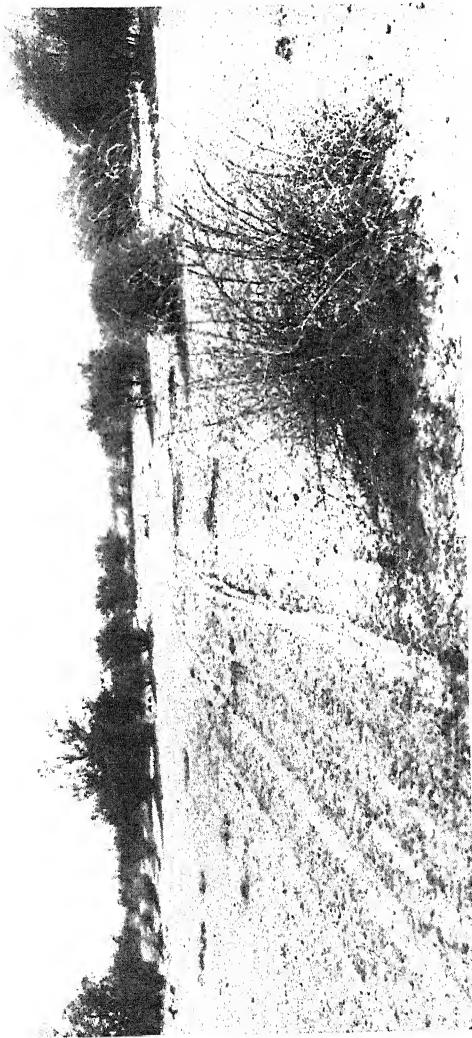
	1860-1.	1861-2.
Receipts	Rs. 1910	Rs. 2227
One-eighth share to Zemindars	238 { 621	278 } 1045
Establishment	383 { 767	
Total balance	1289	1182

The procedure in force was simple. Any person desiring timber applied to the Assistant Commissioner, who specified the forest from which it was to be cut. The applicant then went to the tehsildar concerned, paid the fees in advance, and a chuprassi was deputed to mark the trees to be cut. A limited time was allowed to cut and remove the trees, after which those still remaining in the forest belonged to Government. If timber was required for public purposes the requisite fees were paid. To the peasantry Government gave fuel and timber for house-building, etc., freely, the free grants so made in 1861 and 1862 being as follows :

	1860-1.	1861-2.
Coniferous trees	643	496
Brushwood for fuel	32,483	32,623

The daily consumption of fuel by the 112 houses at Murree during the season was estimated at 250 maunds per day, and the amount of fuel used in the bazaar per day was considered to be about the same. The three largest consumers gave their approximate annual consumption at this period as : The Brewery, 33,000 maunds ; Lawrence Asylum, 3000 maunds ; Commissariat, 20,000 maunds.

The set of Rules for the conservancy of trees and brushwood in the Rawal Pindi Division, which were issued by Major



A RUKH IN THE PUNJAB. THE VEGETATION CONSISTS OF *CAMPARIAS APTILLIA* (IN FOREGROUND),
SALTADORA AND *PROSOPIS SPICIGERA*
From "Indian Forester."



Cracroft in 1856, were based on the foregoing remarks on the management of the Murree Forests. The Rules commenced by stating that "in the mountainous and hilly portions of the Rawal Pindi District, all trees and shrubs of spontaneous growth are hereby declared to be the property of Government." These Rules have been already quoted, *vide* p. 273.

THE FORESTS OF THE RAWAL PINDI DISTRICT

Cleghorn alludes to the considerable tracts of waste land (rukhs), partly hill and partly ravine, in the Pindi District which produced no lofty trees, but yielded a large amount of fuel, on which sissoo could be raised and existing species reproduced. The area of these lands was unknown, but considerable, and the revenue from them would increase. The settlement then in progress would eventually determine what area of this tract would be left to Government, after portions had been assigned to the zemindars, and whether any compact blocks were available for forest purposes. The chief timber trees of the area were blue pine, *Pinus longifolia*, *Quercus ilex*, mulberry, tun, sissoo, olive, *Acacia modesta* and a *Vitex*.

"For several years," says Cleghorn, "efforts have been made to preserve the forests, but the demand for public works and private purposes has been very great, and the finest trees have been felled. In the tracts contiguous to Murree, where fires are strictly prohibited, young trees are springing up in great numbers, but in other places reproduction does not appear to keep pace with expenditure. The consumption of fuel is enormous, and in some places small success has attended continuous efforts to grow trees by broadcasting the seed."

In a Report submitted to the Financial Commissioner in 1862 by Cracroft, the following statement of "rukhs," or waste land, separated from village boundaries was given :

Tehsil.	Rukh.	Number of villages within Rukh boundary.	Area in acres.	Remarks.
Futteh Jang .	Kairi Moorith .	53	68,302	The measurement is approximate. The land is all uncultivated.
	Topee .	1	297	
	Dhannial .	1	1091	
	Pind Kala .	7	766	
	Mallakpur .	1	623	
	Total . .	63	71,009	

A tract of land, hilly with level patches, near Rawal Pindi, called Rukh Topee, had been formerly leased for grazing, but as young trees were much injured the practice was discontinued about 1859, and for three years it had been carefully preserved and inspected. "The growth," says Cleghorn, after inspecting the area, "is now satisfactory, and the experiment interesting, showing that Nature unrepressed reproduces rapidly if all cutting and stubbing out of roots is stopped. Roads have been made to open out the rukh and facilitate supervision. A large number of seedlings of *Pinus longifolia*, sirris, tun, pulahi (*Acacia modesta*) and olive have been raised by broadcasting seed without watering. The tun requires some care, also the *P. longifolia*. It is desirable that rukhs near other large towns should be treated in a similar manner."

The establishment consisted of four jemadars, three duffadars and forty-three chuprassis, a larger number, Cleghorn considered, than necessary. The cost was defrayed by a fuel tax similar to that of octroi.

The rates of seignorage levied per tree varied from Rs.10 for tun, Rs.6 for sissoo, Rs.4 for *Q. ilex* and blue pine, Rs.3 for mulberry, *Pistacea* and *P. longifolia*, Rs.1 simul (*Bombax malabaricum*) and silver fir, 8 annas for pulahi, 4 annas for Khair (*Acacia Catechu*) and olive, and smaller sums for the rest.

Timber and fuel were sold in the city of Rawal Pindi at this time at the following rates :

Sirris	1 foot 4 inches cubic per rupee.
<i>Pistacia integerrima</i>	" " " " "
Khair	" " " " "
Vitex	1½ feet square per rupee.
Deodar	" " " " "
Pulahi	1 foot 2½ inches cubic per rupee.
Fuel { Unsplit wood	8 maunds per rupee.
| Split wood	4 " " "

No other descriptions of timber were sold in the Rawal Pindi market at this period.

In 1860-1 the receipts were Rs.3436 and the expenditure Rs.695, giving a balance of Rs.2741; in 1861-2 the receipts were Rs.5864, the expenditure Rs.1985, giving a balance of Rs.3879. The increases were due to enhancement of rates and additions to establishment.

This favourable position as regards forestry supplies was due to the efforts and energy of Cracroft, the Deputy Commis-

sioner, who had thoroughly grasped the importance of the timber and fuel questions. He defined the work in prospect as follows :

- 1st. To demarcate all rukhs, or preserves for fuel or timber.
- 2nd. To distribute the establishment so as to ensure the careful preservation of the rukhs.
- 3rd. To provide for the reproduction of trees and fuel by closing tracts of country where fuel is exhausted, and by broadcasting seed.
- 4th. To persevere in, and extend, the area of experiments in Rukh Topee, and preserves elsewhere.

Whilst cordially endorsing the above able definition of the objects to be arrived at, Cleghorn adds : "The chief points to be remembered are, the selection of a tract where young trees are springing up, showing the capabilities of the soil and its fitness for growing wood, and then the careful protection of the young trees from grazing of every kind."

CHAPTER XXIV

FOREST OPERATIONS BEYOND THE NORTH-WEST (PUNJAB) FRONTIER, 1858-1864

TIMBER SUPPLIES FROM THE INDUS, SWAT AND KABUL RIVERS

IN the early 'sixties of last century the territories beyond our North-West Frontier were almost entirely unknown. A few stray and adventurous travellers had penetrated into this wild and lawless territory ; Burnes, for instance, visiting Kabul early in the century, whilst Griffith went to Afghanistan and back somewhere about 1839. The course of the Upper Indus from Acho at the bottom of the Astor Valley to Derbund (i.e. "closed door," an appropriate name), a distance of about 160 miles, was quite unknown to Europeans. And yet at this period a considerable amount of timber came down the Indus, Swat and Kabul rivers, and a brisk trade was carried on. It was the existence of this trade, and the considerable stores of deodar and other timber seen at Attock and Peshawar, which stimulated Cleghorn during his visit to the Trans-Indus country to institute enquiries into its source. The information resulting from his investigations, which to some extent goes back beyond 1858, enables a clear impression to be gained on the position of the timber trade at this period, and to some degree as to the extent which the forests, over the march of this turbulent border country, were being indented upon to supply the new demands, to which the activities in construction of railways and public works within our territories had given rise. These activities, as has been shown, were the outcome of the new policy of development which had supervened with the change in Government of the country on the disappearance of the old East India Company.

The Indus. Until three or four years previous to Cleghorn's investigations in this region very little wood had been sent down the Indus. No record existed on the subject of the timber supplies of the Upper Indus, the forests of which were

outside the British sphere of control, and had scarcely been inspected even cursorily. A Report on the river had been drawn up and published, by Lieutenant Wood, Indian Navy, in the *Journ. As. Soc., Bengal* (Vol. X, p. 518). On the subject of timber he dealt with the matter solely from the point of view of material for boat-building and fuel for the steamers. It was known that the valley of the Indus had been famous for its timber from the days of Alexander down to the year 1841. Forests of sissoo existed on either side of the river and on numerous islands from Torbela to Attock, but these had been wastefully felled during the rule of the Sikhs, "and the remaining trees adorning its banks had been swept away by the terrible flood of 1841" (Major J. Abbott, *Jour. As. Soc., Bengal*, XVII, p. 231). Cunningham, in his *Ladak*, p. 135, says: "Indeed, the most striking effect of the cataclysm is the entire absence of trees in the valley of the Shayok, while the lateral valley of Nubra was full of trees upwards of a hundred years old."

From the junction of the Gilgit River to Attock the course of the Indus is south-west, the distance being about 300 miles. This length of the river was little known, but even at Ohind, fifteen miles above Attock where the river debouches into the Church Plain, the current is more rapid than that of any other river in the Punjab. According to Captain Mont-gomerie, of the Great Trigometrical Survey, as has been already mentioned, on the 160 miles from Derbund to Acho the course was unknown to Europeans in 1861.

Few natives of the plains ever ventured beyond Umb, the only persons who could safely do so being the Shaikzadas of Ziyarat. Popular superstition had invested these people with sanctity as the descendants of a notable saint; and this sanctity safeguarded their persons and property among the wild Kohistanis. The Shaikzadas brought down deodar logs from the forests in the independent States upon the Upper Indus. They procured the wood from the Kohistanis, and the superstition which clothed them secured the safety of their property during its passage through the independent Pathan settlements situated between the forests and Derbund. The timber was floated as far as Derbund, where it was stopped and a toll of 8 annas a log levied upon it by the Chief of Umb. Merchants from Attock and boatmen from Jehangera came up here to buy timber, floating it down from this point in rafts. The Chief of Umb was a minor at this period, being a feudatory

of the British Government, and owned territory on both banks of the Indus. He possessed great influence on the Upper Indus and was entitled to the toll on timber, but the levy of the same toll on all logs, the latter varying greatly in value, and the detention of the timber, which often took place, were hardships which Adams had endeavoured to persuade the Chief to mitigate, as yet without success; although it was to the Chief's interest to encourage the wood trade. The independent Pathans of Kabul and Kyab also started a system of levying tolls on all timber which came within their reach, but this had been promptly stopped by Adams. They received fair payments, however, for all the help they gave in floating rafts or launching stranded timber.

The requirements of the Sind Railway Company were responsible in the first instance for creating a market for timber brought down the Indus. This demand was not maintained at a high pressure for long, and at this period (1862-3) the trade had fallen off to some extent. It had been realised, however, that the supplies would at best be very irregular, since they entirely depended on the wants of the people in the hills who would only take the trouble to send down timber to Derbund in any quantity when their need for money or supplies became urgent, or when it suited them. It was considered, however, that the trade was capable of great extension.

The deodar wood from the main Indus (or *Abba Sein*, i.e. Father River) was held to be the best in quality by the native dealers and carpenters; the timber was said to be more resinous and durable than that of the logs brought down the other rivers. Major Robertson and Captain Henderson had tested many logs in 1856, reports on their experiments being published for the use of the Thomason Engineering College.

The Swat River and Valley. In the early 'sixties of last century the course of the Swat River was very imperfectly laid down on the most recent British maps, the Swat Valley, though so near the British frontier, being practically unknown. The only description extant at the time appears to have been drawn up by Captain Raverty (*Jour. As. Soc., Bengal*, 1862, p. 227), based upon the narrative of a native of Kandahar. The latter stated that the lower ranges were treeless and grass-covered; the higher hills on either side were clothed with forests, consisting chiefly of the deodar, edible pine

(*P. Gerardiana*) and wild olive. In the cultivated tracts the Plane (*Platanus orientalis*) flourished. At the extreme head of the valley near Sardzaey, in the vicinity of the pass leading into Kashkar, the Report states, "there are immense numbers of trees both along the river banks and on the mountains on either side to their very summits." Dr. Bellew told Cleghorn that the dues for large "pines" (Cleghorn sometimes uses the word in his Report to cover all the conifers including deodar) were 4 annas royalty to the Khan, and 4 annas for felling and launching.

The timber operations on the Swat River at this period were almost entirely in the hands of an old border tribesman, who bore the rather appropriate appellation of Papa Mea, and must have been a remarkable man amongst those turbulent people. Papa Mea was head of the Kakakhel Sayeds, and was described by Major Sandilands, the builder of the Peshawar Road, as "a fair-dealing old man, somewhat stubborn and difficult to manage, but frank and independent," a courteous description which displays the Frontier Officer's appreciation of the fine qualities which often exist, amongst so much that is treacherous and bad, in these border tribesmen.

The following description of Papa Mea's methods, penned at the period, depicts to perfection the monopoly which this shrewd old man had established. Native traders who had tried to break it by purchasing timber in the Swat Valley were treated with scant respect by the Swati Afghans, who took their money and then stole the timber. But Papa Mea was not treated in this fashion :

"He sells at his own price, rarely at less, fulfils his agreement and seldom supplies bad material. He lives on his own jaghir (land grant) called Walli, near Nowshera, where there is an expense yard. His people go where they choose up the three rivers, and the perils of eternal punishment attend those who injure them in any way. Papa Mea, therefore, is the principal man with whom extensive dealings may be carried on. He has a large wood yard at the village of Hashtnagar, near the confluence of the Swat and Kabul rivers, which is in British territory. This dépôt often contains 5000 logs of various sizes, and may be said to command the market in its present limited state. I believe that considerable quantities of deodar may be obtained from the Swat Valley, if Papa Mea's terms are agreed to, and intimation is given to him six months before."

The great proportion of the logs sent down the Swat and Indus rivers were of very short lengths, due partly to the difficulties of transporting the timber from the forests to the rivers and partly to the fact that the natives had formerly valued the logs not according to length, which was the custom of the British officials, but according to thickness and, say the Reports of the period, "they are slow in apprehending our object in desiring long scantling."

Bellew wrote the following interesting note for Cleghorn on the timber trade of the Swat Valley late in 1863 : "Formerly most of the timber came from the hills of Pultan, Palus, Chilas and Taldardial, all in the Kohistan. Of late, however, this trade has been stopped by order of the Akhund, who decreed that it was better to abstain from a trade that led to quarrelling amongst the Faithful, whilst infidels alone benefited. The circumstances mentioned above" (an allusion to a native trader, who had been treated very badly by the Swati tribesmen, who stole all his logs, and had complained to the Akhund who had intervened without success), "led to the latter denouncing the trade (doubtless fearing that it might imperil his authority over the tribesmen) which is now suspended, at least in the hills of Swat. At present the only timber coming down the Swat River is felled at Tal Patrak, a district of Bajawar, under the control of Ghazan Khan of Dir. The river at the foot of the hills is called Malizai Sind, and appears to be either the Punjkora River or a branch of it. It joins the Swat River at Arang Barang, and the united streams are called Sandai. The timber is collected in the Malizai and marked by the traders, who come down on the rafted timber as far as Mian Banda. Below this the Likandai rapids occur, and the logs must be floated singly. A few miles lower is the ghât of Abazai, where the timber is again rafted and floated to Charsadda, Prang and Baharra, between which contiguous ghâts is a timber dépôt, supplying Nowshera, Akora and Attock. Timber can only be floated in the summer months. The usual scantling is 20 feet by 10 by 6 inches. The traders *take guns, pistols, etc.*, as douceurs for Ghazan Khan and Akhunzada. With care and encouragement the trade may be increased, but the rapids at Likandai are an obstacle to the safe passage of large timber."

The italics in the above passage are the author's. It is very evident that the little Frontier Wars of the future were not foreseen at this date, when an official in a Government Report

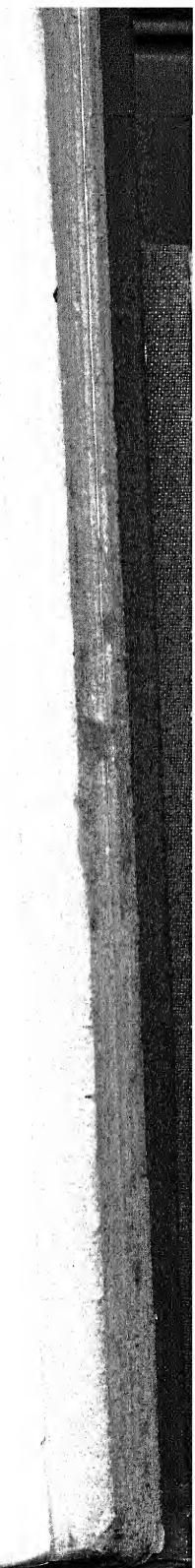
can allude, without comment, to the practice of propitiating a frontier chieftain with *guns and pistols* with the object of procuring timber!

The Kabul River. The vegetation of the valley of the Kabul River was first described by Griffith (Posthumous Papers, Calcutta, 1847), who accompanied the Army which marched in 1838-9 from Sind through Quetta and Kandahar to Ghazzai and Kabul. At Kabul he apparently quitted the Army and marched across the chain of the Hindu Kush to Bunian and Singhan, and spent some time in the Kuner Valley, a most daring and adventurous journey for those days. Griffith formed valuable collections of plants under most difficult circumstances, many of which are in the Royal Herbarium at Kew. He made some interesting remarks on the forests. "The lower ranges of the Safed Koh (White Mountain)," he wrote, "are black with firs in some places and the course of the Kabul River is rapid, flowing between singularly rounded ranges. Timber is cut in considerable quantities, and is floated down in spring to Kabul. From Kabul to Jellalabad the river is often fordable, but only useful for irrigation. Towards the lower end of the valley, in the direction of the Khyber Pass no forest whatsoever is visible, solitary or scattered trees only being present." The distance between Jellalabad and Peshawar by the river route is ninety miles. Half-way the large village of Lalpura existed, where resided the Chief of the Mamund tribe. A few miles below Jellalabad the Kabul River is joined by the Kuner tributary (the Kaure of Elphinstone), which drains the valley of that name and is practicable for rafts. By this river the best wood was sent down to Peshawar. Griffith had already given some account of the narrow Kuner Valley, having visited Pushut, the chief town. "The mountains," he says, "are well wooded at a certain height and in greater quantities than in the valley of the Kabul River; very different, however, from the Himalayan Forests, dotted in parts rather than uniformly clothed with forests." The *Q. ilex* ranges from the river bed (2500 feet) up to 4500 feet; the olive from here to 6500 feet, and above that the deodar. "Between this height (6500 feet) and the summits of the ridges, which attain a height of about 10,000 feet, the deodar reigns supreme, vast in abundance and in size. These forests are available for the timber supply of Jellalabad and Peshawar." Large "pine" forests were also supposed to lie along the Olipore branch of the Kuner River, which comes from the

western portion of Kaffiristan, and falls into the Kuner River at Chighar Serai.

In Hooker and Thomson's Introduction to the *Flora Indica* mention is made of the forest belt on the southern slopes of the Hindu Kush, extending from 5000 to 10,000 feet, confined entirely to the mountains which rise out of the valley of Jellalabad, and not extending to the west further than the sixty-ninth degree of longitude; elsewhere the country being extremely barren, and almost destitute of vegetation. The trees are chiefly oaks and "pines." They also allude to the forest mentioned by Griffith on the Safed Koh. The "pines" alluded to are *Pinus excelsa* and *P. Gerardiana*, *Abies Smithiana* (*Picea morinda*) and deodar, the latter being the most abundant; *Juniperus macropoda* also occurs in the colder parts. With the oak (*Q. ilex*, a species which extends from the South of Europe to Kunawar) were species of *Aesculus*, *Olea*, *Myrtus* and *Amygdalinus*.

For some years previous to the time of Cleghorn's visit to this region all the timber required for the city and cantonment of Peshawar had been brought down the Kabul and Kuner rivers. The timbers were ready squared, often split with wedges, and roughly dressed with the adze, but never sawn. Unless specially indented for the size did not exceed 24 feet by 5 by 8 inches. Up to 1858 larger scantling was not procurable save by accident. On one occasion Major Sandilands, visiting the ghát one day, observed a log of unusual dimensions, and enquired if such could be obtained. The native contractor said he was going to Kabul for wood, and would endeavour to procure large timber. He brought down several logs 28 and 30 feet long by 15 by 20 inches. Subsequently some thousand fine logs were brought down. There was always, however, great delay in procuring these large sizes, and sometimes two years elapsed before they reached Attock. Bellew also furnished Cleghorn with an interesting note upon the Kabul River timber trade. He wrote: "The timber floated down the Kabul River is felled on the Karr Kacha, an offshoot of the Kuner Mountain, between Jellalabad and Kabul. 'Nakhtar,' the generic name of pines among the Afghans, of which there are several kinds, is the only wood cut. The mountaineers fell, mark and convey the timber to the stream below. They then float the timber down in rafts to the Naguman Ghát, where they sell the wood to the agents of the Peshawar merchants. There are agents for the purchase





ARID HILLS AND VALLEYS OF BALUCHISTAN AND WAZIRISTAN, WITH SCATTERED OLIVE AND
PISTACHIO TREES ON SLOPES

of timber at the ghâts of Michni, Matta Danuai and Khirana. The timber is felled at all seasons, but can only be floated down from the middle of June to the middle of September, when the streams are swollen by the melted snows. Most of the timber brought down is of small size, but a few logs are of 2 feet in diameter and 30 feet long. The supply is very uncertain. No Peshawar man can visit the timber districts. Their agents at the several ghâts agree with the timber-cutters of the Kohistan as to the quantity and dimensions of the timber they are to bring down the next year. Of late years the timber trade on this river has greatly increased. The timber is used in the city and cantonments of Peshawar and also in boat-building. The number of boats built on the Naguman is much greater during the last few years. They are built entirely of Nakhtar wood, and carry merchandise (chiefly wool) as far as Karachi. The chief impediments to the further increase of the trade are the disturbed state of politics at Kabul, uncontrollable delays, and the faithlessness of the contractors."

All of which impediments were unfortunately destined to persist—perhaps to the advantage of the forests: for uncontrolled fellings of the nature undertaken would have rapidly resulted in their ruin.

The merchants who supplied Sandilands and his Assistants with timber were chiefly Hindus, and they incurred difficulties and dangers to which Mahomedans would not have been subject. As they did not dare to ascend the rivers themselves they employed Pathans, and these often treated them badly and robbed them. Papa Mea only worked on the Swat and Indus rivers, and Cleghorn was of opinion that it was on these rivers that the trade should be stimulated by the extension of railways and public works. He makes no allusion, however, to the harmful effect on the forests on these rivers and on their catchment areas, even though they were outside our frontier, of the totally uncontrolled methods of felling by which the trade was to be carried on, and the danger to the water level of these rivers which eventually flowed through British territory which must ensue therefrom.

As has been said the deodar timber of the main Indus River was considered the best, then the Swat River timber, whilst that of the Kabul River often appeared immature, and was considered more brittle than the other two. Mr. Browne, Executive Engineer, Kohat, stated that the deodar from the Kashgar Hills, by the Kuner tributary, was beautifully grown

without knots and splits, and was equal to the Jhelum timber; but he agreed with Sandilands that the timber from Jellalabad was not of such fine quality. The Indus timber was sold at 4 to 6 annas per cubic foot. For logs of extra length 7 to 8 annas was paid. The logs averaged 9 to 12 feet; a few ranged up to 18 feet. The Swat timber formerly sold at 5 annas a cubic foot; the new agreement with Papa Mea was for 6 annas 3 pie per cubic foot of picked timber. The logs were short and usually very thick.

The Kabul timber was procurable of any length, the price varying from 5 annas to 1 rupee per cubic foot. The Public Works Department was the chief consumer, as the natives did not require long timber. The merchants made sure of the price they were to receive for the timber before going up to bring it down. The scantlings brought down the Kabul River up to this period varied from 50 feet by 18 inches by 18 inches (one log of this dimension) to 24 feet by 12 inches by 9 inches to 24 feet by 10 inches by 7 inches. Those from 30 feet by 16 inches by 15 inches down to the 24 feet scantlings formed the bulk of the timber sent down.

Peshawar Fuel Supplies. Cleghorn says that at this period : " Almost the only means of becoming acquainted with the vegetation of the forests round Peshawar, is to study the twigs and branches brought for sale as firewood, or as pads for camels. To explore the woods without a guard is dangerous and against regulations. Griffith was attacked when botanising in the neighbourhood, and his servant lost two fingers." Mulberry, sissoo and babul (*A. arabica*) were found in the plains; in addition to the deodar and *Pinus longifolia* brought from the hills, walnut and ash were also obtainable, to a limited extent.

Dr. J. L. Stewart, who was appointed the first Conservator of Forests in the Punjab in January, 1864, had endeavoured before this date to identify the woods used for fuel by means of the bark and the Pushto names, and had published a valuable account of the flora of the Peshawar Valley. The following extract is of interest :

" The uncultivated parts of the Peshawar district are barren in the extreme, there being no forests, and shrubby vegetation is only seen towards the base of the surrounding hills, where small streams occur. This consists of *Acacia modesta*, *Olea europaea*, *Dodonoea* and *Reptonia buxifolia*, which grow abundantly as one ascends the hills, while in

the dry and barren low ground, the most conspicuous shrubs are *Zizyphus jujuba*, *Adhatoda Vasica*, *Capparis aphylla*, *Salvadora*, *Vitex Negundo* and *Tecoma undulata*. All timber of any size is afforded either by the cultivated trees of the valley, such as the mulberry and sissoo, or by the timber rafts of the Swat and Kabul rivers. The firewood supply of the cantonment is furnished by the above-named shrubs, and large quantities of oak (*O. ilex*) are brought from the Khyber. It appears not unlikely that, ere many years elapse, the supply of firewood for Peshawar at reasonable rates will be difficult or impossible."

Firewood was selling at Peshawar, says Cleghorn, at about four maunds and charcoal at two maunds per rupee.

Waziristan and the Kurrum. "The value of the timber of the hills of Waziristan to us," says Cleghorn, "is very small ; if we except the limited supply of firewood afforded by the shrubby vegetation of the outer zone, which is similar to that along the frontier, few of the indigenous shrubs are used, and these only in the construction of agricultural instruments, and the roofs of small buildings, etc." The oaks of the inner hills were far too distant from the plains to enable the timber to be made use of for house-building by the inhabitants of the latter ; and the same applied to the coniferous timber from the Pir Gal.

The portion of the Trans-border country most conveniently situated for the supply of timber was that adjacent to the sources of the Bara River ; whose numerous tributaries flowed from the southern spurs of the Safed Koh Mountains between Kurrum and the Khyber. Major Lumsden told Cleghorn that this elevated region, inhabited by the Afridi and Orakzai tribes (who have since become only too well known to our Frontier Officers and Frontier Force) and known as Teera Maidan, had the summit and slopes of its ridges clothed with deodar and pine forests, whilst below walnut, plane, horse-chestnut, apple, apricot and other trees were found. The internecine feuds of the tribes inhabiting Teera Maidan, had hitherto debarred the development of the resources of these forests, from which short timbers could be floated in the season of flood down the Bara stream to Peshawar.

The valley of the Kurrum River, which rises near Huryoob, beyond the ridge of the Solimani Mountains, was little known, but was said to contain pine forests. Reference had been made

to these in Elphinstone's *Kabul* and Bellew's *Political Mission to Afghanistan*. Dr. Stewart had also seen them during the Waziristan Expedition. Lumsden thought it would be quite feasible to float timber from Huryoob, Chum kunnie and Kurrum itself down the Kurrum River to Bannu, though he remarked that there were portions of the stream where, except in floods, long timbers would have to be assisted, owing to the tortuous course of the river. "The valley of Kurrum and its adjacent tributaries," says Lumsden, "being held in jaghir by Afghan Sirdars, who are poor, arrangements could doubtless be made to cut and float the timber down to our territory; from Thul Billandkhel it must be sent either by hand to Kohat or down stream to Bannu." It appears to have been considered that the political and economic advantages would be great, but the Kurrum is a small river, even at its mouth, and Cleghorn had doubts as to whether logs could be floated down from the hills.

In the Bannu District a natural sissoo forest, known as the Kachi Forest, existed, extending over 14 to 15 miles on low alluvial land upon the left bank of the Indus, between the villages of Bukkri and Futtikhan, and more sparingly for fifteen miles lower down, or altogether thirty miles from Kalabagh. Cleghorn strongly recommended that this forest, which was suffering at the hands of the increased population and their cattle, should be preserved, and his recommendation resulted in a small establishment being sanctioned by Government in 1862. There was another large forest of sissoo and olive, about ten miles from Kohat, which he thought might also yield a considerable supply of timber. "This and the Kachi Forest," says Cleghorn, "are the only sources from whence any great supply of sissoo can be obtained in the Punjab." "And," he added, "there are few trees in India which so much deserve attention as the sissoo, considering its rapid growth, durability of the timber and its usefulness for many purposes; the wood is universally employed when procurable by Europeans and natives where strength is required. Great efforts have been made to introduce this tree, and where there is depth of soil (as in the Kachi Forest) it grows to large size."

Sissoo and large babul were used for boat-building, which was an important industry on the Indus. Five types of boats were used on this river between Attock and the sea. Those best known were the "zoruk" of the Upper Indus; the

"dunda," which plied from Mithankote to the sea, and the "dugga," which owing to its stout build was specially suited to the rapids between Attock and Kalabagh. Owing to the shortage in the supplies of sissoo and babul various other species of timber had to be employed in addition to these two in the construction of these boats, such as deodar, *P. longifolia*, *Quercus incana* and Karil (*Capparis aphylla*). Malabar teak was much prized on the Lower Indus and fetched a large price. The sides and bottom of the ordinary ferry boats were constructed separately, and these parts were then secured by knees or crooked pieces nailed on to them. The bottom was made of sissoo, the knees of mulberry or olive and the side planks of deodar. The wedges and trenails were usually made of *Morus loevigata* and olive. Ropes for rafts and boats were prepared either from hemp (*Cannabis indica*), sirkhi (*Saccharum spontaneum*), *Typha latifolia*, or other reeds common on the river bank. Munj (*Saccharum munja*) was also commonly employed by native boatmen.

The great boat-building localities of the Punjab at this period were Pind Dadun Khan, Wazirabad and Jhelum; but there was a marked increase in building on the Indus, not only at Attock but at Nowshera, Hashtnagar, Mokhud and Kalabagh. The "duggas," after dropping down to Sind, were sold, as the cost of towing them back again against stream exceeded the value of the boat.

CHAPTER XXV

FOREST OPERATIONS IN THE PUNJAB, 1858-1864 (*continued*)

THE FUEL SUPPLIES OF SIMLA AND THE PUNJAB PLAINS

DR. FALCONER'S remarks on the subject of the fuel supplies of Simla and the neighbouring hill stations in this part of the Himalaya in 1853 have been alluded to in a previous chapter. Cleghorn's observations made during a visit to Simla and neighbouring military stations ten years later are of added interest, since at the time he wrote them he had not read Falconer's Report. The origin of Simla has already been detailed (*vide p. 282*). The year following Cleghorn's visit (1864) the Governor-General, Lord Lawrence, came up to Simla accompanied, for the first time, by the Supreme Council and all the public offices, and the Station became the summer capital from that year onwards. For many years previously to 1864, however, successive Governors-General had resorted to Simla, with more or less regularity, for some weeks during the hot season ; but in these earlier years only a small staff of officials accompanied the Governor-General. The first visit of a Governor-General to Simla was that of Lord Amherst, in 1827. After his progress through the North-West, celebrating the triumphant ending of the Bhartpur campaign, Lord Amherst proceeded for the summer months to Simla. This was the foundation of Simla's greatness.

In the years since Falconer's visit the Fuel Supply question had grown increasingly difficult. Cleghorn had the opportunity of discussing the matter with the Deputy Commissioner, Lord William Hay (who had so ably held charge of Simla and the district during the terrible Mutiny days), and several of the old residents of Simla, and had to guide him his experience of the same class of difficulty which had engaged his attention at Ootacamund and elsewhere in the South. The trouble at Simla was aggravated owing to the fact that the summer

capital was encircled by territory belonging to independent Hill Chiefs in which the forests or fuel-cutting areas were situated. There had been little regulation in the fellings carried out and, as Falconer had shown, the waste and destruction before 1853 had been appalling. The position now was worse than ten years before.

Some difficulty was experienced in calculating the requirements of the Simla community. At this period there were 980 houses with an average, it was calculated, of not less than 1800 fires burning daily throughout the year (at that period Simla was nearly empty during the winter). This gave a consumption of not less than 900 maunds *per diem*. The following calculation was drawn up by Lord William Hay, Cleghorn and representatives of the Hill Chiefs :

MEMO. OF WOOD USED AT SIMLA (1863)

	Maunds.
Firewood for Europeans	201,600
Charcoal , , maunds 12,600, representing in wood	18,900
Firewood for servants of Europeans	13,240
Firewood for native residents	87,200
Charcoal , , maunds 4,400, representing in wood	6,600
	Maunds
	327,540

=900 maunds *per diem*. It was estimated that each European house burnt daily 2 maunds (160 lbs.) of wood and 6 seers (1 seer = 2 lbs.) of charcoal.

In the Military Stations of Kasowli, Dugshai, Sabathu and Jotogh the returns of the Commissariat officer in 1860-1 showed that 67,669 maunds of wood and charcoal of the value of Rs.18,045 were used (Kasowli, 18,623 maunds ; Dugshai, 29,372 ; Sabathu, 16,163 ; and Jotogh, 3511). This amount was exclusive of the consumption in the houses of officers, the bakery and brewery and the amounts used by the Engineer Department. In the same year the Lawrence Asylum, Sonawar, used 8769 maunds of wood and 697 maunds of charcoal. This amount in proportion was far greater than the amounts consumed at Simla and the other stations ; but as has been mentioned only small amounts were used at Simla during the winter in those days, whilst only small detachments

remained at the Military Stations during the winter. It was computed that the consumption of fuel during the winter months at Sonawar was double that of the summer ones. It is of interest to remember that the duty of building the Lawrence Asylum for housing and educating the children of European soldiers on service in India, was assigned by Sir Henry Lawrence to a young subaltern, by name Hodson (who had had a University education, unusual in those days, and came into the Army via the Militia). Hodson planned and built the Asylum and was the first Principal. This young officer subsequently became famous as a distinguished leader of Irregular troops, and is known to posterity as Hodson of Hodson's Horse. He was killed in the Indian Mutiny warfare.

The Principal of the Lawrence Asylum at this period, who had the reputation of being an accurate observer, estimated that the amount of fuel used at Sonawar in 1861 corresponded in the aggregate to 600 trees of forty years' growth, and strongly recommended the use of stoves as an economic method of safeguarding the fuel supply. "The economy of fuel," he said, "by using *close* stoves is one-third, but open stoves save nothing. The economy is effected by regulating the draught by means of a revolving perforated valve in front." The cost of these stoves was stated to be about Rs.20, the stove used at the Asylum being made by a native artificer there. "The same stove will suffice for warming contiguous rooms, or an upper story, without any additional expenditure for fuel." Cleghorn was greatly impressed with the method of using stoves at Sonawar, and wrote: "I would strongly recommend economy in the use of fuel by employing close stoves and improved kitchen ranges. This has been done with good effect at the Sonawar Military Asylum, and also, I believe, at the Wellington Barracks on the Nilgiri Hills. The surgeon of the Rifle Brigade, Sabathu (Dr. Fraser), is of opinion that 'the introduction of stoves into military stations would be an improvement.' It is probable that it would effect a considerable saving of fuel, whilst the surface of air warmed by the stoves is much more extensive." He also recommended that supplies of fuel should be stored under cover, especially during the monsoon months, as was done "in well-regulated private houses." The ordinary practice was to dump the material in some convenient spot in the open and leave it exposed to inevitable deterioration from the weather; a habit which

was not only conducive to great waste, but which resulted in the fuel owing to deterioration not affording the amount of heat which would have been produced had it been properly protected.

In addition to fuel much timber was required for building and other purposes. When we picture the size of the Simla of to-day compared with the 980 houses of 1861, the enormous amount of timber which was to be used for this purpose alone can be readily realised. On this subject of building timber Cleghorn writes : "On the road between Simla and Mahasu, the principal forest from which house-building materials and charcoal are derived, I passed in three hours, within six miles of Simla, 41 woodmen carrying deodar posts and planks, 18 laden charcoal burners and six laden lime burners. This may be considered as an indication of the large requirements of the community."

Owing to the fact, previously alluded to, that the forests encircling Simla were in the territories of independent Hill Chiefs, the question of forest conservancy presented many difficult aspects. At this period the chief supplies of wood came from these forests, only a very small amount being obtained from thinnings within the Station of Simla, these latter being sold by auction under the orders of the Municipal Committee.

The species of tree used for the fuel supply of Simla were *Quercus incana*, *Rhododendron arboreum*, *Pieris ovalifolia*, the blue pine and deodar and "some other jungle trees and stout underwood." At Kasauli and Sonawar, *Pinus longifolia*, which clothed the surrounding hills and split easily, was the chief wood supplied by the fuel contractors. The only forbidden wood was that of *Grewia oppositifolia*, which emits an offensive smell when burning. The villagers used the withered stems of *Euphorbia* and thorny bushes to eke out their fuel supplies.

The general cost of firewood was 3 annas per man's load of 60 lbs. The contract rate at all the military stations in 1861 was 300 lbs. per rupee. Charcoal sold at R.1 per maund of 80 lbs. ; the best for kitchen use being obtained from *Quercus incana*. The price of fuel had not increased much since Falconer reported on the subject ten years previously, but it was being brought from greater distances, and it appeared that an increase in price was inevitable. House-building timber had greatly increased in price during the ten years.

Attempts had been made to form plantations with the object of assisting fuel supplies, but only indifferent success had been attained by the few amateurs who had made the experiments; and, says Cleghorn, "the wants of the community are not likely to be supplied to any great extent from this source." The late Rev. Mr. Parker had planted and carefully tended 8000 trees, not more than 400 of which were thriving in 1861 on the Sonawar Hill, chestnuts and walnuts in shady spots being the most promising. Of the 20,000 trees planted near Kotgur by Conductor Mines in 1845 (alluded to by Falconer, *vide p. 284*), only a small proportion survived in 1861. The failure here, however, was attributed by Cleghorn, who inspected the plantation, to the site chosen, bare grass land, being unsuitable. He considered that, generally speaking, the nature of the soil, and the drought for nine months of the year, appeared to be hindrances to successful planting in these hills; "pine trees, *P. longifolia* especially, do not grow well in artificial plantations; there are some shady spots in valleys at an elevation of 4000 to 5000 feet, with a northern exposure, and favourably situated as to moisture, where small plantations might be formed of such trees as willow, mulberry, chestnut and walnut; but I concur with the opinions recorded by Mr. Edwards and Mr. Barnes with regard to Simla; and Mr. Batten as to Kunawar, states 'it is difficult in a garden, with every means of watering at hand, to show a good sized *P. longifolia* tree after ten years of care.' The Rev. Mr. Parker furnishes the following approximate rate of growth for the *Pinus longifolia*. He writes, 'I think that trees of the diameter named below have the ages assigned to them or nearly so.'

Old wood 6 inches diameter, 20 years.

„	9	"	"	30	"
„	12	"	"	45	"
„	15	"	"	55	"
„	18	"	"	70	"

"I believe that wild *P. longifolia* trees grow much better on a hill-side (with a north aspect) scantily covered with soil, than in any garden, and they make more wood than is indicated above, but under any circumstances they form a precarious supply."

Cleghorn naturally alludes to the fuel plantations being

formed with Australian species with such success in the Nilgiri Hills, but added that these species would not stand the Simla frosts. There were some sheltered spots at a lower elevation, as for example, near the Soldier's Garden at Sabathu, where he thought the seeds of these naturalised species might be sown as an experiment; but he correctly said, "as a general rule the most rapid grown indigenous species are best suited for this purpose."

Cleghorn strongly advocated the continuance, under careful supervision, of the steps which had been put in force by Mr. Edwards and Lord William Hay. The formation of plantations would necessitate the upkeep of a costly establishment. The efforts of the above two officers had been devoted to the conservation of the conifer forest, oak copse and solid under-wood which existed. The main points to insist on were: 1st, to prevent the cutting of young trees; 2nd, to keep out the herds of village cattle "which break the young seedlings and deprive them of shade without which their growth is very slow. I consider this of great importance. Experience has shown in other districts the impossibility of preserving a young forest, when wood-cutters, cows and goats are permitted to enter it."

This history of the Punjab Forests at this period will have clearly indicated that many of the Civil Officers, Commissioners, Deputy Commissioners and their Assistants, had commenced to fully appreciate the necessity of introducing conservancy into forest areas with the object of putting an end to wasteful and uncontrolled exploitation and the unchecked grazing and firing by the native population. Lord William Hay, after ten years' experience as Deputy Commissioner in the Simla hills, has perhaps drawn as vivid, concise and true a pen picture of the case as it existed as had been portrayed up to that time or since. He summed up the position as follows:

"The usual history of a forest on the hills is this: The wood-cutter enters, fells many trees and damages many others by the tree falling down the steep slope, the branches not having been previously cut off. A heap of chips and debris remains which takes fire by accident or otherwise, the villagers send their cattle for pasturage, and in a very few years some scattered pines are all that remain of a once flourishing forest."

Here we have epitomised the epitaph of many thousand

square miles of magnificent primeval forest which disappeared in the course of centuries from India and of no inconsiderable portion which was swept away during the first sixty years of British rule in the country. The new spirit and gradual awakening to a full understanding of the position was to result during the next sixty years in a remarkable piece of work, no less than the conservation of what remained of the forests of the country, their extension and great improvement and in the building up of an effective administration, a work due to the close interworking and co-operation between the civil and forest officials.

The proximity of the considerable population at Simla had naturally resulted in great destruction of the indigenous forests, particularly on the southern exposure, which was the favourite aspect for house sites and more thinly clothed with forest. The forests had necessarily been cleared away to some extent for agriculture, owing to the high prices obtainable for corn, milk, potatoes and vegetables. The opening out of these agricultural lands had decreased the amount of wood available, and this extension would add to the difficulties of securing, and the cost of, the fuel supplies. Cleghorn strongly advocated the preservation of the remaining deodar forests. He observed that the natives carefully preserved their sacred groves of deodars, and that to the State the wood was of the greatest importance for house and bridge building. It rather appears from this remark that Cleghorn, after his first arrival in the Himalaya, had some idea that since the natives regarded the deodar as sacred in the temple groves they would attach the same sanctity to the tree in the forests. If so his investigations in the valleys of the Five Rivers speedily undeceived him.

Mr. Brandreth, Commissioner of the Cis-Sutlej States, told him that the Hill Chiefs around Simla were now becoming alive to their own interests in conserving their forests, since they derived some revenue from the sale of wood and charcoal; and that to some slight extent they were endeavouring to regulate the felling and clearing so as to prevent particular spots from being denuded. The revenue collected by these Chiefs was levied by a charge of 8 annas per mensem on each wood-cutter. The annual revenues resulting to the Rajah of Patiala and Ranas of Keonthal and Kolbie were given by their native representatives as Rs.300, Rs.500 and Rs.200 respectively; but as Cleghorn naïvely remarks, when the

supplies coming into Simla from these regions are taken into account "these amounts are certainly understated"!

In the Nilgiri Hills Cleghorn had undertaken some investigations with the hope of introducing peat as a fuel. He made enquiries with this object, but could not discover that peat bogs existed on the Simla Hills. A sample of turf fuel from the confines of Tibet had been submitted by Falconer to Dr. Percy of the School of Mines, Jermyn Street, and Cleghorn subsequently found good peat in the Mid-Himalaya at the Sach Pass, "resembling Irish turf in its character and in the genera of producing plants."

Cleghorn concluded with the following suggestions :

" Whenever the natural Forest belonging to Government becomes thin, seeds of indigenous trees (oak, deodar, etc.) common to such localities should be sown before the rains. This might be done within the bounds of Simla under the orders of the Municipal Committee, and in the Military Cantonments by the Executive Engineer or Commissariat officer. The same course should be strongly urged upon the native chiefs (to whom the forests mainly belong), through the Civil Authorities."

THE FUEL SUPPLY OF THE PUNJAB PLAINS AND SIND

The question of making provision for the considerable amounts of fuel required for steamer and railway purposes in the Multan Division being one of importance, Cleghorn investigated this matter in the cold weather of 1862. He proceeded to Gugaira and Multan, passing through several of the fuel reserves fringing the Lahore and Multan road, and from thence to Muzaffarnagar, traversing the sandy tract between the Chenab and the Indus. In travelling south Cleghorn noted that the wastes became more covered with jungle and the population and cultivation less. There were several Government Departments interested in this fuel matter. The Civil officers were the Commissioner of Multan, the Deputy Commissioners of Multan, Gugaira and Muzaffarnagar; the other departments were represented by the Senior Naval Officer, Indian Navy, Superintendent, Indus Steam Flotilla, Public Works officials and several of the members of the Staff of the Punjab Railway Company, with all of whom Cleghorn discussed the matter and received approximate estimates of their departmental requirements : the demands were very

large as the accompanying figures indicate, more especially those for the railway and steamer requirements :

FUEL REQUIRED AT MULTAN IN 1862

	Maunds.
Indus Steam Flotilla	200,000
Her Majesty's Government Steamers	110,624
Railway Workshops	60,000
Railway bricks	60,000
Commissariat	20,000
Executive Engineer	20,000
	<hr/>
	470,624

=230,000 cubic feet, or 4600 loads at 50 cubic feet the load. These demands on the part of public departments were sufficiently serious in 1862, as they did not take into account the fuel requirements of the population. But the position was aggravated by the fact that the locomotive consumption had not yet commenced, as only a small portion of the railway was at that time open to traffic. It was, therefore, difficult to forecast the annual requirements of fuel in the future when the railway was completed and running a full complement of trains. Cleghorn, therefore, anticipated that "without careful management difficulty will ere long arise in procuring the adequate supply for public purposes, and perhaps inconvenience may ensue to the neighbouring population. It is, therefore, necessary that certain tracts of jungle available should be reserved, demarcated, and put under regulation. It would also be important to ascertain the different kinds of wood, and to take care that no waste of material occurs in working and using the fuel. The Provinces of the Punjab and Sind are more sparingly provided with tree vegetation than other parts of the Indian Empire, and conservancy is, therefore, more requisite. In Sind a Forest Department has been organised for some years which fulfils the desired object, and yields a considerable revenue to the State."

At Lahore the great demands for wood and grass had led some years back to the reservation of a large area of the rukh land, and some attention had been given to the question at an early period of our administration. In Multan the selection of rukhs for preservation had been guided by the position of the fuel stations on the rivers. With the advent of the

locomotive the demands would be larger in the future and would be greater in the south than in the north, since in the south both railway and steamers would have to be supplied.

It had been already proposed that the following tracts of scattered jungle existing in the different sub-divisions of the Multan Division should be set apart as "fuel preserves":

	Total area in acres.	Reserved tracts in acres.
Gugaira . .	1,271,833	26,0000
Multan . .	2,000,000	77,000
Muzaffarnagar . .	900,000	92,000
Total . .		<hr/> 195,000

Cleghorn suggested that these should be placed under a system analogous to that in force in Sind, "the vegetation and requirements of the two provinces being remarkably similar."

It has been already indicated in a previous chapter (p. 277) that the question of steam fuel on the Upper Indus first attracted attention in 1851. Mr. Edgeworth, the Commissioner of Multan, recorded his views on the subject, views which were corroborated by Dr. Stocks, the Forest Ranger in Sind, who wrote the Memorandum on the subject, which was also briefly reviewed.

In 1862, Colonel Hamilton, Commissioner of Multan, considered that the supply of fuel near the city would be exhausted in a few years, but that an almost inexhaustible supply could be obtained from the *bar*, at an enhanced rate; and Captain Tighe, the Deputy Commissioner of Muzaffarnagar, told Cleghorn that there was much jungle in the tract subject to the overflow of the Indus and Chenab rivers, and that favourable sites for planting existed near those rivers, some of which Cleghorn was able to subsequently inspect.

The fuel supplies for the steamers were in the hands of native agents who superintended the cutting and stacking of firewood at equidistant points on the river banks; these men engaged the labourers and measured up the fuel, being responsible that the necessary supplies for the steamers were always available at the fuelling depôts. A similar arrangement is in force at the present day on the great Russian rivers which

carry the greater bulk of the traffic and merchandise of that country, the local people cutting the fuel and transporting it to the fuel depôts on the banks at which the steamers call and replenish their supplies. On the Indus the wood was not weighed, a tedious process, as Cleghorn says, but stacked and measured. A stack of 100 maunds of wood "formed a pile 15 feet square and 3 feet high," he says, "and the duty of the fuel agent is simply to measure the stack of wood with a 15-foot rod. The billets are required to be not less than 8 inches in circumference and of uniform length."

Cleghorn makes no remarks upon the method of stacking. And yet, unless this were done by those expert at the work and under supervision, the amount of wood in different stacks would be very unequal and could be easily under the 100 maunds.

The fuel agents were paid Rs.20 per month below Multan, and there were fuel stations at Multan, Khangur, Sultan ki shah, Bakri, Jibbi and Mittenkote. Steamers proceeding from Multan to Jhelum, or from Mittenkote to Kalabagh, obtained their fuel on application to district officers, and paid the same rate as charged by the fuel agents, at the time Rs.15 per 100 maunds or 4 tons, i.e. Rs.3.7 per ton. It was said that the quantity of fuel prepared for these occasional trips was usually in excess of the consumption from fear of the stock proving deficient. The system, however, had by now got into working order, and below Multan no complaints were made. In Sind the wood stations were under the Forest Ranger, at this time Mr. Fenner, and all steamers obtained their supplies from his stocks.

In a dry climate like the one experienced in this country it was highly necessary, although Cleghorn makes no special allusion to the fact, to have definitely laid down the amounts of fuel which would ordinarily be utilised in any month. The ordinary species and sizes used for fuel are subject to very rapid deterioration, firstly, from the great heat and drying action of the sun, and, secondly, from the attacks of some species of beetle borers (species of Sinoxylon, etc.), which tunnel into and oviposit in the billets, the grubs subsequently reducing the wood to powder. Enormous waste and losses must have taken place from those causes in the fuel depôts of the Punjab.

At Multan a charge of 4 annas per boat load and 2 annas per camel load of fuel was sanctioned in 1863, a rate which

Cleghorn considered reasonable in view of the enhanced demand for wood.

The jungles on the banks of the Indus and Chenab consisted chiefly of *Acacia arabica* (Babul), *Prosopsis spicigera* (Jhand), *Populus euphratica* (Bahn, or Sofaida on the Sutlej), *Salvadora oleoides* (Pelu) and *Tamarix articulata*.

The babul produced excellent timber, the value of which, as in Sind where some babul logs had yielded as many as four sleepers, Cleghorn foretold would daily become more recognised. For steamer fuel it was excellent. The supply was not large and was inadequate to meet the demands for agricultural implements and boat-building, and its growth should be extended. Dr. Henderson had successfully raised plantations of babul at Shahpur. His method he gives as follows :

" I have tried to raise Kikhur (babul) trees by simply scattering the seed in the jungle. Most of the seeds germinated after the first shower, but few survived the first week of hot dry weather. I next tried scratching the surface with a native plough, but again failed. I then tried sowing, exactly like wheat, but rain falling before the seeds germinated, the ground caked afterwards, as hard as a stone, and scarcely a single seed even germinated. At last I hit on a method which, having succeeded at Shahpur, one of the most arid districts in the Punjab, is likely to be more successful elsewhere. The directions to be followed are very simple, and with ordinary rains will almost certainly ensure success.

(1) Low ground should be chosen where water remains a few days after rain ; or wherever grass grows well.

(2) Plough the ground thoroughly as if for a grain crop, as soon after the 1st July as possible ; if it can be done before the end of June, so much the better.

(3) Collect fresh seed in June, thoroughly free it from the pods, and scatter it on the ploughed surface at the rate of eight to ten seers at least to each beegah ($=\frac{5}{8}$ acre), and double the amount if seed is abundant. Thick sowing makes the young trees shoot up rapidly and straight, and it is much easier to thin them afterwards than to fill up blanks. I may mention that seed does not keep well through the cold weather ; a weevil attacks it ; and unless collected the moment it is ripe the goats leave very little to collect.

(4) The seed must be left on the surface, and not covered up, and the first heavy rain will make it germinate.

(5) The plantation must be thoroughly fenced with thorns to keep out goats and sheep for two seasons at least ; after that, if the seed has germinated well, it will probably form such a thicket that no animal can penetrate it. Then it is time to thin out one-half of the trees, after which a fine crop of grass will grow under the shade of the remainder. To shelter the plantations from frost strips of jaur may be sown at intervals from west to east and allowed to stand until all chance of frost is past, but neither jaur nor anything else should be grown amongst the trees. During the first winter many of the stems will die down if frost is severe, but the first shower in spring will cause the root to sprout again."

Henderson said that babul seed sown in July, 1862, and treated on the above lines without irrigation or watering, had produced trees from 12 to 18 feet high and 8 inches in circumference at 1 foot from the ground, and that seed sown at the same time and freely irrigated had produced trees 25 feet high and 12 to 18 inches in circumference at 2 feet from the ground. The time is not specified, and this information is contained in a footnote to Cleghorn's Report, but this latter is dated October, 1864, so this was apparently a growth of two years only.

The *jhand* is one of the characteristic trees of the Punjab, and at this period furnished more firewood to Lahore and Multan than any of the other species. The poplar was not liked. The wood was objected to as steamer fuel, as it sparked and thus endangered the awnings of the boats.

The *pelu* fringes the sandy tracts, but gives an inferior fuel.

The tamarisk was abundant in the saline tracts, and furnished a great part of the fuel of Sind and the Southern Punjab. It is easily propagated by cuttings and quickly reproduced from old roots. The wood burns fast, but gives out great heat. Mr. Fenner, the Forest Ranger in Sind, in a Report (1862-3) considered "a tamarisk jungle of 10 years' growth admirably adapted for fuel purposes ; the wood contains a good deal of resinous matter, which makes it the more valuable. It is easily felled, and usually procurable within reasonable distance from wooding stations. All that seems necessary, therefore, for future supply is that these tamarisk jungles be conserved in eligible localities, and not sacrificed entirely for the benefit of cultivation."

THE FUEL SUPPLY FOR THE PUNJAB RAILWAYS

A considerable correspondence took place at this period between the high officials of the Government of the Punjab and between that Government and the Government of India on the subject of the best method of making provision for the fuel supplies which would be required for the Punjab Railways then under construction. Brandis and Cleghorn were both consulted in this important matter, and submitted a joint Memorandum which it is proposed to discuss here.

Mr. D. F. McLeod, Financial Commissioner of the Punjab, as an outcome of a meeting of officials held in the office of the Lieutenant-Governor, drew up a Memorandum, dated 13th January, 1863, dealing with this question. The officials present were the Secretary to Government, Financial Commissioner, Commissioner of Lahore Division, Assistant Commissioner of Lahore and the Consulting Engineer of the Railway.

Many applications had been made to Government for grants of waste land in the Government rukhs of the Lahore District which had now become capable of irrigation from the Bara Doab Canal. Permission to dispose of these lands had up to date been withheld, as it was believed that the wants of the railways in the matter of fuel could not easily be met unless a portion of them were reserved from sale and maintained for the purpose of supplying the railways with fuel. At the same time it was strongly held that the land having become so valuable for the extension of agriculture, as much as Rs.20 and even more per acre having been offered for some of it, that in the interests of the land revenue the land could be more profitably used for agriculture than for the production of fuel. The consumption of fuel for the sixty miles of railway comprised within the Lahore District, supposing three trains ran each way daily at an average of about one maund per mile, was estimated by the Engineer to amount to about 120,000 maunds yearly. The estimated amount of wood standing on the 11 rukhs already set apart for the railway was about 200,000 maunds only, or a little more than 1½ years' supply. It had been calculated that ten years were required for the renewal of the timber, provided the roots were not injured; in other words, to maintain a continuous supply almost six to seven times the area already reserved would be necessary. The entire amount of timber standing on the available rukhs

of the Lahore District was estimated at about 2,000,000 maunds, so that, if the above method of supplying fuel to the railway was resorted to, nearly the whole of this would be required for the purpose.

With these facts before them the general opinion of the officers present was that the advantage to be obtained by the reservation of the rukhs for the supply of wood would be altogether incommensurate with the sacrifice involved. They justified this expression of opinion as follows:

The Assistant Commissioner (Captain Hall) pointed out that while the timber standing *above ground* on the rukhs was 200,000 maunds only, owing to the larger portion of the underground part of the trees compared to that above ground, the above quantity of wood would be more than doubled if the roots were pulled up when the trees were cut, thus affording a sufficient supply of fuel for the railway for twenty or thirty years. "If, therefore," states the Memorandum, "on these rukhs being disposed of, it were stipulated with the purchasers that as the area was reclaimed all the standing timber, including roots, should be sold to the railway, there would be no ground for apprehending a deficiency of fuel for some years to come at all events."

An extraordinary fallacious and short-sighted argument emanating from a body of highly placed officials.

Allusion was also made, and here they were on safer ground, to the vast areas of waste lands, covered with brushwood existing further down the railway in the Gugaira and Multan districts as well as across the Ravi in Sharrajkpur and Kunialia, where the timber could be floated down the river to any point required. It was also suggested that if special arrangements should hereafter be found necessary for growing fuel rather than reserve valuable lands of large extent unirrigated on this account, belts of timber might be grown along the canal banks, or in selected areas where the trees could be irrigated and so made the produce a large amount of wood per acre.

For the above reasons it was determined unnecessary to reserve generally within the rukhs of the Lahore District or those of Amritsar, which, though fewer in number and smaller in area, were analogous in character and circumstances.

Cleghorn had already urged that a special officer should be appointed to the charge of the Lahore rukhs, in order to conserve their resources in fuel and grass, and the committee suggested that Mr. Birnie Browne, who had been employed

on the Bara Doab Canal, should be appointed to the post, the expenses of the supervision and management, it was held, being easily recoverable from the revenue made out of the reserved rukhs.

The Committee touched upon the very large area reserved for the supply of grass (five to six acres per animal) to the horses of the cavalry and artillery at Mian Mir. This large area comprised some of the finest lands in the Doab, capable of the fullest irrigation from the new canal. The horses now maintained at Mian Mir were far fewer than had been the case when the military were originally given possession of this large tract. So far the attempts of the Civil Authorities to reobtain possession of a part of this land had been met with a military "non-possumus."

In a Resolution, dated 29th January, 1863, on the above Memorandum, the Lieutenant-Governor endorsed the recommendations of the Committee, and ordered the Commissioners of Lahore and Amritsar to submit without delay a descriptive list of all rukhs which it was proposed to offer to the public, in order that the terms of purchase might be notified. He sanctioned the appointment of Mr. Browne, his duties to be notified thereafter, and authorised the dispatch of the portion of the Memorandum dealing with the Mian Mir cantonment land to the Military Department.

The Lieutenant-Governor was very prompt and evidently agreed with the views of his Committee.

The Proceedings were forwarded to the Public Works Department with the Government of India for an expression of opinion.

This opinion by no means endorsed the action of the Committee. It was pointed out that the exact requirements of the Punjab in the matter of fuel were left in doubt, and that this doubt should be removed before the existing reserves were finally disposed of. The Punjab Government, it suggested, might be desired to cause the question of fuel supply for the railway to be thoroughly taken up, having reference to the whole line from Delhi to Multan. The necessary supply per mile per train should be estimated, and the positions of the fuel depôts be settled and the annual demand at each ascertained. From the latter the area of land to supply each could be fixed. Information was required on other heads, such as distance it would pay the railway to carry fuel, the charges of transport, possibilities of forming plantations and cost of

fuel to railway and so forth. Also the Authority who should undertake to provide the wood, the Government or the Railway Company? It was suggested that the new Forest Department, when organised, should be charged with the work. "It is plain," stated the Memorandum, "that before it can be said that the sale of the rukhs will be *profitable*, it must be known that the Government will not eventually have to make up, in the shape of the payment of guaranteed interest on Railway capital, for the cost of wood enhanced by the clearance of the existing reserves. The present receipt of a few thousand rupees by the sale of these waste lands, and the consequent increase of the land revenue, will possibly not compensate for the loss that will arise from enhanced working expenses owing to high-priced fuel. On such points it is dangerous to make assumptions without due consideration."

The Memorandum also drew attention to the fact that if it was proposed to give up the rukhs and make provision for the railway by new plantations that the latter would not come into bearing for eight to ten years, and that provision would have to be made for this period. Also if the rukhs only existed in the Punjab special arrangements would have to be made between the Sutlej and Jumna, and also for the line through the Doab. The Memorandum concluded: "The questions involved in the provision of a cheap and constant supply of fuel in these provinces, where coal is almost certainly never to be got, and the existing quantity of land planted with wood is not great, are on the whole of a nature that will call for very careful consideration, and they cannot be too soon taken up."

Brandis and Cleghorn contributed a joint Memorandum to this discussion which, apart from the direct recommendations it makes on the point at issue, is of great interest owing to the outline sketch it contains of a forest policy and the results of forest administration in this region which it foreshadows. This Memorandum, which is dated Simla, 19th August, 1863, and signed by both officers, is therefore given in detail:

"(1) With reference to recent correspondence on the Government Rukhs of the Punjab, we think it necessary to draw attention to the following points:

(2) After reviewing in a preliminary way, the probable contents and annual yield of the intramontane forests, as far as existing data enable us to do so, we have come to the conclusion that unless the price paid for deodar timber by the

Railway Company, the Public Works Department and the general public rise considerably, the management of these hill forests on *conservancy principles* is not likely to yield a large (if any) net revenue.

(3) In favourable years there may be a surplus of receipts over working charges, cost of conservancy, and quota of establishment, but upon the whole we do not expect (without cutting more timber than conservancy principles warrant) that the receipts will exceed the total charges.

(4) A larger net revenue might, indeed, be obtained by limiting *strict conservancy* management to a small number of well-defined tracts, conveniently situated for the removal of timber, and well stocked with trees. The remaining forests being worked merely with a view to obtain the greatest possible amount of timber at the present time.

(5) This concentration of forest conservancy operations is a point worthy the consideration of Government. It may be urged that, under proper management, all forests, including those less advantageously situated, ought to give a good supply of timber, and consequently a surplus revenue, but this is a fallacy which must be guarded against.

(6) In the first years of forest conservancy, it is only the best tracts which yield a surplus revenue, and before the rate of timber production on a certain area has been ascertained, it may be necessary to limit the cuttings to a low figure to make sure that timber is not removed in excess of the annual rate of production.

(7) It is, indeed, possible to work the hill forests profitably for a short time in a revenue point of view, if the agency system merely be carried on over the whole extent, but this is not conservancy, and the forests would be annihilated in a few years.

(8) The conclusion at which we arrive, after a careful consideration of the data before us, is, that the hill forests are not likely to be more than self-supporting, and occasionally from physical obstructions, uncertainty of floods, etc., the outlay may exceed the proceeds. We look, therefore, to the forests in the outer hills and plains of the Punjab for the yield of a regular surplus revenue.

(9) In the intramontane forests, the trunk of the tree only is removed, the tops and branches very rarely bear the cost of transport, and thinnings below a considerable size are valueless.

(10) In the forests upon the slopes of the outer ranges this is not the case, and in the plains all loppings and thinnings are valuable, while the sale of grass yields a considerable income.

(11) Independently of the grave question of fuel supply for Railways and Steamers, a sufficient area of the best Rukhs (grass and wood preserves) should be reserved, and permanently placed under the Forest Department for the production of timber, firewood, charcoal, etc. This will yield a steady surplus revenue, which may from time to time be required to make improvements in the other forests.

(12) If the Rukhs in the Lahore, Amritsar and other districts, be capable of irrigation, they should not, on this account, be given up to cultivation, but a suitable area of compact shape, and having good soil, should be appropriated for the growth of timber trees (*Dalbergia Sissoo*, *Acacia arabica*, *Acacia Lebbek*, *Prosopis spicigera*). Sissoo, Babul, Siris and Jhand, grow well in the Punjab on lands liable to be submerged, or with a little irrigation, and other useful trees will doubtless be found to succeed.

(13) The admission of these premises does not imply the necessity of reserving all the Rukh lands. The expediency of concentrating forest conservancy to a comparatively limited area, holds good in the plains as well as in the hills. The more favourable the soil, situation and other circumstances, the larger will be the production of timber and of forest revenue on a given area. According to the measure of our success in improving the management and increasing the productiveness of the Rukhs, we will be able to follow the suggestion of Mr. Macleod, Financial Commissioner, in his memorandum of the 13th January, 1863, in reducing the area of the reserved tracts.

(14) However, the selection of the Rukh tracts to be reserved should be made by the Conservator of Forests, and until that Officer has indicated the tracts which he considers necessary for the welfare of the country, and the requirements of the Forest Department, no Rukh land should be sold or otherwise disposed of. Until the selection is made, we think that the management of all the Rukh lands, whether ultimately reserved or not, should rest with the Forest Department.

(15) One source of revenue from these lands is the sale of grass or grazing dues. By resolution of Government in the Financial Department (dated 11th February, 1863), this

item of sayer was excluded from Forest Revenue. This may be regarded as an objection to the transfer of the whole of the Rukh lands to the Forest Department, but the above resolution may perhaps admit of reconsideration. We are of opinion that it would be highly inexpedient to exclude the amount realised by sale of grass on lands under the control of the Forest Department, which appears to be a legitimate item of forest revenue, and is so considered in Sindh and elsewhere.

(16) The question of the comparative advantage and disadvantage of the occupation of land by forests or by grain, is one upon which there is much difference of opinion, but it is generally admitted that an extension of the forests would tend to preserve a little moisture in the exceedingly dry climate of the Punjab. The heavier falls of dew where forests are, and the retention of moisture tend to ameliorate the climate and to fertilise the soil."

The suggestions in the above Memorandum that the rukh lands should be placed under the charge of the Forest Department was accepted by the Government of India, a paragraph in their letter, dated 7th December, 1863, reading: "Respecting the management of the Rukh lands, I am desired to say that it would appear expedient, in the first instance, to make them over to the Forest Department. The selection of the lands not to be retained can be made subsequently."

In a subsequent communication, however, dated 5th March, 1864, this order was reversed by the Government of India:

"On a reconsideration of the above papers, the Governor-General in Council is of opinion that the orders given in the Public Works Department Letter of 7th December, 1863, were issued under a misapprehension, and is now pleased to direct that the management of Rukhs in the Punjab shall be entirely withdrawn from the Forest Department, and remain as heretofore in charge of the Revenue Officers.

This determination as to the executive management of the Rukhs, which should be altogether in the hands of the District Revenue Officers, need not in any way interfere with the employment of the Forest Conservator for the purpose of inspecting these tracts, and advising as to their management, should such advice be thought desirable by the Punjab Government."

And, as a matter of fact, Dr. J. L. Stewart, who had been appointed officiating Conservator of Forests in the Punjab in accordance with Cleghorn's suggestion that such a post

should be created, had, before the year was out, drawn up a full and concise Report of the fuel resources for the supply of the Punjab Railway.

One remaining source of supply, likely to become of great importance, Cleghorn thought, had not yet been dealt with, viz. the plantations on the Western Jumna, Bara Doab and Inundation Canals. Dr. Stewart proposed to visit and report upon these.

CHAPTER XXVI

FOREST OPERATIONS IN THE NORTH-WEST PROVINCES AND OUDH, 1858-1864

In a previous chapter the campaigns against the Gurkhas in 1814-16 were briefly alluded to. As a result of these campaigns the northern parts of the North-West Provinces, known as Kumaun and Garhwal, came under British rule. This region stretches eastward from the Sutlej, consisting of an area of territory mainly situated in the Himalaya, but including the tract of country stretching along the base of the mountains, and known as the Terai. This portion of the Himalayan region was reported to contain fine forests of conifers as well as broad-leaved trees, but at this period the region was almost unknown. The same may be said to have been the case with the inaccessible parts of the broad belt of sâl forest in the Terai lands, though the accessible areas had been treated hardly by the people.

In the absence of any attempt to introduce forest protection or forest conservancy into the forests of the North-West Provinces and Oudh the people were still carrying out, in the late 'fifties, the ruthless methods of exploitation which had been in force for centuries. Whole forests were being devastated by fire and by unregulated fellings. The forests were burnt every year either to clear the undergrowth for hunting or by the graziers to obtain a crop of young grass.

A brief review of the first attempts to mitigate these evils in the North-West Provinces and Oudh, will be given in this chapter. It may be stated at once, however, that the North-West Provinces were more backward in this respect than the other provinces already described.

As a first step towards introducing some amount of supervision and regulation in the management of the forests the Commissioners of Divisions were appointed *ex officio* Con-

servators of Forests within their divisions in 1860. The Commissioner of Kumaun and Garhwal, Colonel (afterwards Sir Henry) Ramsay, took up the question of putting a stop to the devastation of the forests with enthusiasm, and in the plains forests of his charge stopped to some degree the promiscuous hacking by all and sundry who entered at will into the forest tracts. In the Gorakhpur District a commencement had been made in some of the forests on the same lines.

About 1860 it was decided to create a sanatorium for British troops at Naini Tal. This now well-known hill station had been discovered a few years previously by Ramsay. At that time there was only a vague report of a beautiful and sacred valley high up in the mountains uninhabited by any save a few *jogis*, or priests, but with no known path leading to it. Ramsay undertook an expedition to explore the lofty peak of China Pahar, and during a march came suddenly upon the lake at Naini Tal nestled in a secluded valley under the summit. The steep hills which surrounded it on every side were then clothed with a dense forest of evergreen oaks (*Quercus incana* and *Q. dilatata*) and other species. The forests were at the time the favourite haunt of wild animals—sambhar, gural, bear and tiger being abundant. Ramsay said that he had seen a herd of wild elephant climbing up the steep slopes of China, and that he had in those days such shooting as he had nowhere else found the equal of. He built himself a two-storied house at Naini Tal on the plateau of Ayar Pathar; other houses were built soon afterwards, as also a native bazaar. In those early days a very steep path had been engineered up the face of the precipice from the Juli side, up which everything had to be carried. The Government of the North-West Provinces subsequently followed the Commissioner's example and decided to make Naini Tal the summer head-quarters, and it was determined to add a sanatorium for British troops. It was the period of activity and clear, shrewd foresight by men of the right stamp which followed the Mutiny. Conspicuous amongst these was Ramsay. He had formed and administered the provinces of Garhwal and Kumaun with brilliant success, and he saved his division during the Mutiny by taking the bold step, for it was a bold one to take, of promising the Gurkha sepoys the contents of the treasury at Almora if they remained true. This was in the darkest days of the Mutiny when, without a European soldier near to protect them, he had hundreds of English

women and children, refugees from Mussoorie and the plains, under his charge.

Ramsay at this time was the acknowledged autocrat of these hill districts, and was greatly beloved by the hill people, who had for so long been misgoverned. He developed with considerable skill and energy the resources of his charge. Amongst others he took up the question of the forests, and was the first Conservator of Forests of this region.

When the decision had been come to that accommodation was to be built for troops at Naini Tal, and now that it had become the head-quarters of the Local Government, it became necessary to improve the means of access to it ; for the steep coolie path was far from adequate. It was decided to construct a good road from the foot of the hills up to the new summer head-quarters, and Mr. T. W. Webber was appointed to the charge of this work in 1861, the road taking the best part of three years to construct. In describing this work Webber remarks that timber was plentiful, and he burnt his lime on the spot. But the road was not an easy one to build, owing to the well-known shaly nature of the strata on many of the slopes of these mountains.

In proceeding to his new charge Webber graphically relates the tedious method of travelling of those days. The choice lay between riding, or bullock (or pony) cart, where a road existed, usually for short journeys ; or the palanquin or dhooley for long journeys, when it was necessary to post through, and no post carts existed, or through roadless parts of the country. Such journeys were often done at night. Webber's description merits reproduction, since this antiquated method of travelling was still the general one in 1860, and survived much later in many parts ; is not, in fact, yet extinct in 1920. "The dust of an unmetalled road, with the dense smoke of flaring torches, had filled the air all night long and made it unbreathable. The monotonous 'Huh, huh ! huh, huh !' of the black and perspiring *Kahars*, or dhooley-bearers, as they struggled along under the weight of a primitive apparatus, made of canvas stretched on a rough framework, and called a 'dhooley,' had made the night everlasting. There had never been a chance of five minutes' consecutive sleep for the weary traveller reclining within. The long bamboo on which the vehicle hung, borne on the shoulders of four men, while four more ran beside, taking shift every five minutes, following the torch bearer, swung horribly from the trotting motion of the bearers,

who, instead of trotting out of time, would drop into step, thus causing the bamboo to bend with the steps of the carriers, and the unlucky passenger to be shot up and down in the dhooley like a parched pea on a drum. The sliding doors on each side, if closed to keep out the dust and flare of the smelly torches, would also exclude what slight air might be stirring, and the heat inside would be stifling. Added to these discomforts, the uncertainty of finding fresh relays of bearers at each ten-mile change, and the yelling of the tired men to announce their arrival to the fresh bearers who might be asleep by the roadside, or perhaps still in their village, had also a disturbing effect on the traveller's sleep. Ditto the demands for backsheesh, in addition to the legal pay already given before the journey is commenced, in consideration for the unexceptionable excellence of the manner in which the stage had been performed." It can be readily understood that on a night's journey of from forty to fifty miles performed under these conditions but little sleep was obtained. And yet the old East India Company had made no effort to alter the time-honoured Indian ways of locomotion or to improve methods of travelling even between important cities and towns. The dhooley, the bullock train, the dak-gharry, pony cart, or the more rapid post cart, where it existed, had been the customary means of travelling, and they had persisted. Accordingly, in 1861, Webber travelled through the swamps and tall feathery jungle grass of the Terai, and then through twenty miles or so of the dark green sal forests of the Bhabar by the broad, straight, unmetalled road running from Bareilly to the foot of the Himalaya by dhooley, a hill pony taking him up the mountain-side to Naini Tal.

Webber spent the next three years on the work of building the road up to Naini Tal.

In 1862, instructions were sent to Brandis, Superintendent of Forests in Burma, to proceed to the head-quarters of the Government of India to advise on the introduction of a general policy for the administration of the forests of India.

As a first step he was ordered to visit Bengal, Oudh, the North-West Provinces and the Central Provinces, with a view to obtaining a more precise knowledge of the condition of the forests of these Provinces, and the system of working in force in them to aid him in organising a more efficient conservancy, and a more methodical system of management generally. Brandis' visit to the North-West Provinces quickly showed him

the necessity which existed of obtaining a detailed knowledge of what the forests contained before there would be any possibility of forming an opinion as to the extent they could be worked and the amount of timber which they could provide. Also that the ruinous and unchecked system of exploitation in force, combined with unchecked grazing and firing, must be checked. He recognised that the small beginnings made in this direction were useful, but in the absence of all knowledge of the contents of the forests the measures introduced would be of little real use.

He advised the appointment of some Forest Surveyors, whose duties should be to visit all the forest areas and draw up statements as to their position, area, contents and accessibility for working, the information to be obtained from both the hill and plains (Terai) forests.

Webber was appointed as one of these officers, and commenced work towards the end of 1864, and his exploration of the hill forests will be dealt with here.

On being appointed Forest Surveyor in the North-West Provinces, Webber received instructions to visit in order the several localities wherever forests existed, and survey and map out their boundaries and areas, giving careful details of the timber growing upon them, and to report on the quality of the timber and the character of the land it grew upon. The scale of the maps was one inch to the mile, and schedules were attached to each sheet of twelve miles square, giving average number of first, second, third and fourth class trees per acre growing in the forests, only those species of trees which had a commercial value as timber for construction being taken into account, those of no economic value to be omitted.

Webber first explored the hill forests of Kumaun and Garhwal, which extended over an area of 15,000 square miles of actual forest situated all over the division, the latter being 150 miles long by 100 broad, bounded on the south-west by the plains of the Bhabar, and on the north-east by the snowy summits of the Himalaya and Tibet, on the south-east by Nepal, and on the north-west by the Alaknanda, a principal branch of the Ganges. The people were peaceful, and at this time not numerous. The country to be explored was practically unknown for the greater part to Europeans. The Forest Surveyor received his instructions from the Secretary, Public Works Department, every six months, and the reports and maps were sent in through the Commissioner, who was

ex officio Conservator of Forests (up to 1868, when a Forest Department with its own Conservator was inaugurated in the North-West Provinces). The mapping work and reports were undertaken at Naini Tal during the rains.

This forest survey had no connection with the regular survey of the country, which had already been undertaken by the Trigonometrical Survey officers; their maps were available, and were used as the basis of the forest survey. The sheets of twelve miles by twelve were taken on an enlarged scale from the map, and carried in the form of a book, upon which the positions of ridges and spurs were drawn in with the assistance of the prismatic compass and protractor. The forests were delineated, and areas occupied by forest calculated. In each forest the average of the number of trees per acre was taken, by running a line through the forest with a 66-foot chain. The contents of each square chain were counted by the operators. As a result of many observations Webber says that "the general average of a measurable forest was thirty trees per acre, of which about seven were first class or over 6 feet in girth: and usually there was an equal proportion of second and third class trees of 4 feet and 2 feet girth, and a growth of fourth class trees and saplings under 2 feet, fairly scattered through the forest, besides innumerable seedlings not counted." "This was the normal condition of the natural forest, when, as the hoary and mature trees fell from storm or old age, there were generally younger ages ready to take the places of the dead ones." Webber says that he saw very few instances of damage by fire in the hill forests, this being probably due to the paucity of the population at that time. He records finding "where the soil is deep on the less precipitous slopes, magnificent specimens of giant patriarchs of immense age, measuring 30 and 40 feet in girth, with stems like pillars towering to the skies; especially among the deodars, which attain a height of 200 feet and more surrounded by progeny of all ages grouped together in a most picturesque manner. No wonder that the natives reverence this noble cedar as the sacred tree of God (the word deodar is Hindustani, deo, god; dar, tree—God's tree). Its timber is most durable and sweet-scented, and its grain so straight that in some places they split the great logs into boards to construct their temples, and into shingles for roofing, which stand the changes of climate for centuries without any sign of decay."

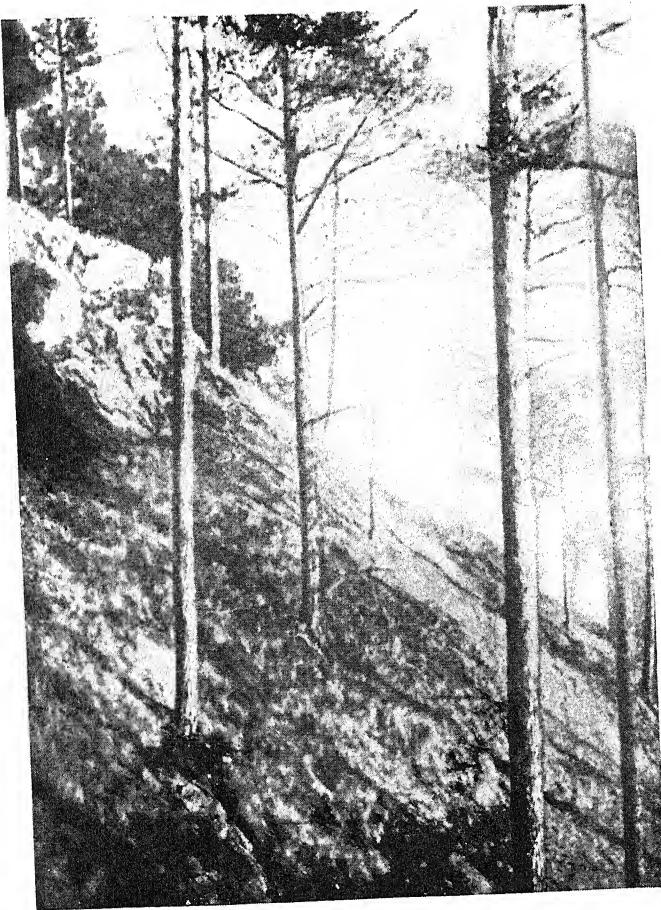
The sacred Ganges rises in Garhwal, its principal branches being the Bhagirathi and Alaknanda, which issue under the latter name (though usually termed the Ganges by Europeans) from the hills at Hardwar in the Siwaliks. The most sacred place in Hindu mythology is Badrinath, where is the head source of Ganga, in the group of lofty peaks known as Gangotri in Garhwal. The adjoining group of the sacred Nanda is in Kumaun, separated only by the River Alaknanda. Here are five lofty peaks rivalling the four of Badrinath, all over 22,000 feet in height, the giant summit of Nanda Devi, 25,749 feet, dominating the group. Webber's first expedition was undertaken to explore the slopes of this vast labyrinth of mountains, intersected by valleys of immense depth and filled with huge glaciers, and map out the forests and ascertain the amounts of timber they contained.

The forests of Kumaun and Garhwal, he reported, contained four different oaks, chestnuts, sycamores, horse-chestnuts, as also the *Pinus excelsa*, or blue pine, growing to a great size; the silver fir (*Abies Webbiana*) growing on the northern slopes up to 12,000 feet, forming dark thick forests, and Spruce (*Picea morinda*), in which the stems were 150 to 200 feet in height. On the lower and northern slopes the forests consisted of the chir pine (*Pinus longifolia*). In some of the ranges near Nepal he records the Cypress (*Cupressus torulosa*), growing only on sunny slopes over 7000 feet, in isolated localities, "one of which is at Naini Tal, where some noble trees were growing under China Pahar 150 feet high, with clean stems to near the top. I measured an old cypress at the back of China 37 feet in girth, and I have measured several deodar trees of 40 feet." The Forest Surveyor concludes these interesting remarks as follows: "These are the principal timber trees which are included in the list of those reserved by the Forest Department as of value for timber for construction. The jungles, however, contain hundreds of other beautiful and excellent hardwood trees, as well as various species of oaks and sycamores, walnut and the elm-like *Celtis australis*, rhododendrons (of which I have measured stems 15 feet in girth of various kinds) besides, lower down, the tropical sal and saj (*Terminalia tomentosa*); while high up near the snow are birch and juniper. Box is also found of good thickness in some of the hills. In some regions the finest forests are so remote from roads that their value is much diminished. The object of the survey was to determine

the position of all the forests, and ascertain what extent existed within reasonable distance of land and water carriage. If the river flowing down the adjoining valley were large enough to float down logs to the plains, it might then be feasible to construct roads or timber slides to transport the logs to the water, as in Switzerland and the Black Forest. This had been tried in the deodar forests of the Punjab, mostly in territories belonging to rajahs. But the great roaring torrents of the Sutlej and its tributaries, rushing in the rainy season through rocky defiles, had been found so destructive to the timber floated down that much loss was occasioned. All such features had to be reported on and sites selected for roads and saw mills."

It will be observed that the lines laid down for investigation by Webber and his staff were very thorough. Unfortunately in his book, *The Forests of Upper India*, the author confines himself for the most part to descriptions of the marches he undertook, with two journeys into the treeless region of Tibet, and to sporting anecdotes. He has little to say of the actual work he carried out in the North-West Provinces, nor does he give adequate details of the condition of the different forests he visited. His book does not, therefore, in spite of the title form the masterly record of the areas, as they existed at this time, which is to be found in Forsyth's pages. Nor are his official Reports to be compared with those drawn up by Cleghorn for the Punjab Himalaya. But it is clear from Webber's Reports that the Kumaun hill forests were un-worked at this period. Many were quite inaccessible, and had never been visited by Europeans. The inhabitants of the plains never went up into the hills, save those only who make the pilgrimage to Badrinath and the Cow's Mouth, where the sacred Ganges issues from a cavern up amongst the snows and glaciers ; and the population of the hills was very small.

After visiting the upper forests, Webber inspected the extensive area of forests in the Pindar River valley, from the glacier down to the junction with the Alaknanda. After leaving the snow-capped mountains the valley opens out lower down, the southern side sloping back with less precipitous hills, which were covered with extensive forests up to their summits. These slopes, Webber remarked, would be suitable for sliding timber down with a view to floating in rafts to the plains. The business required a knowledge of timber transport work, but he considered it would be possible to train the



THE HOT STEEP SLOPES OF THE CHIR (*PINUS LONGIFOLIA*) FORESTS.
N.W. HIMALAYA
From Troup's "Sylviculture of Indian Trees"

villagers of the mountains to the work. "They are already good axemen, and every hillman carries an axe with which he can quickly fell the largest tree. The forests being all Government property there would be no difficulty in exploiting the timber; and saw mills could be easily constructed at the depôts, worked by the side streams coming from the lofty hills above."

Webber was evidently not considering the financial side of commencing such exploitation, and the work when it was taken up cannot be said to have been free of difficulties. It will be unnecessary here to follow Webber in his descriptions of the various forests he visited, these being now well known. He mentions, however, great stems of splendid blue pine, groves of enormously tall cypress, straight and 150 feet high with sharp-pointed tops. In the more sheltered areas on the northern faces of the mountains miles of lofty silver fir forests were seen, "the trees 12 feet in girth, towering to the skies and standing close together; with alternate stretches of the elegant weeping spruce, even taller and grander stems."

Webber alluded to the fact that the middle ranges of the Himalaya were being exploited for tea planting. Robert Fortune had introduced the tea plant from China, and it was found to thrive well at elevations of from 3000 to 6000 feet, producing a more delicate tea than that of the submontane regions in the plains (Terai, Assam, etc.). The Government with the object of encouraging this industry, established several experimental gardens, which proved to be very successful. Among others that at Pauri in Garhwal was worked up to 1861 by Government and then sold to a private planter. The industry was encouraged so as to induce settlers, principally retired Army officers, to embark in tea planting. There were several most thriving plantations in Kumaun at this period. Sites had been selected where the villagers had not utilised the land, and wherever the forest could be cleared away. On the lower ranges south of the Pindar River there were several fine plantations, at Duara Hat, Dunagiri, Ranikhet and other places. Native labour was easily procured, and the slopes of the hills cleared of forest and planted, Government giving grants of China seed from its gardens in Assam. Although a lonely one it was an enjoyable life for the planters, passed amidst the most magnificent scenery and in a fine climate. The opening of the tea gardens in the Himalaya was not, however, an unmixed blessing, for in many cases it had a

deleterious effect on the water supplies of the population at lower elevations owing to the clearing of the forest on the catchment areas of the smaller rivers and streams. The considerable clearances also led to erosion and other evils. In the early days also the planters, regarding the forests in their neighbourhood as inexhaustible, were most improvident and allowed their labour gangs to hack at will, with the result that later on they had difficulties in procuring the fuel supplies required for their factories, labour staff, etc.

Webber subsequently visited the Chir (*Pinus longifolia*) forests of Kumaun, situated, he states, at 4000 to 6000 feet. This typically Himalayan species extends at the lower altitudes on the hot dry slopes and tops from Nepal to the Western Punjab. He found that the average number of measurable trees per acre was about twenty-eight (seven trees in each of the four classes, besides seedlings). The first class trees were over 8 feet in girth, and sometimes measured 14 feet in girth and 140 feet in height, the age of such a tree computed from the rings being 260 years; a second class tree of 6 feet taking 160 years to grow to that size. "All the roads," says Webber, "which traverse the lower hills (generally bridle paths, following the ridges and contours as much as possible to avoid constant descents and steep ascents) pass through miles and miles of the familiar chir forest; and the recollection of those fiery-hot and almost shadeless miles over dry and heated soil and rocks is burnt into the minds of all hill travellers. The ground at certain seasons, before the grass has been burnt over, is covered with the long needles shed in the spring season, and these are so slippery that it is doubly tiring. The heated air is drawn upward by the sun, and whistles and moans through the branches, and the glare from the ground is scarcely modified by the scanty shade from the loose, feathery tree-tops. No underwood grows, as the annual fires, fed by the turpentiny leaves, make a clear sweep of all young vegetation except the grass, which is of a harsh and slippery sort. No one is likely to forget the chir forest, with its heat and wearisome monotony. Yet it is beautiful, and the distant blue ranges seen through the red stems and the light-green foliage of the young trees are charming to the eye." Above the chir grow the oaks and rhododendron, and the blue pine begins to come in, and higher up the deodar. Below the chir come the submontane and plains forests of sâl, *Terminalia*, etc.

The above early descriptions of the chir forests by a Forest Officer has been given since these forests, as will be shown, were at a much later date destined to become a valuable source of economic produce and revenue to the Government. At this period the timber was extensively used for all building purposes at Naini Tal and the other hill stations, and was held to be excellent for floor boarding, rafters and beams for house-building ; but Webber states that " it never failed to twist a bit when seasoned." The forests of these species, he reported, extended all along the valleys of the great rivers Alaknanda, Dhauli and Saiga, where timber could be floated to the plains.

The areas of the forests, according to Webber's survey, were as follows : In Kumaun, 433,951 acres ; in British Garhwal, 253,472 acres ; or a total of about 1074 square miles. Of this area he computed that the chir occupied 152,264 acres ; blue pine, 14,000 acres ; silver fir, 53,800 acres ; spruce, 26,908 acres ; cypress, 4938 acres ; deodar, 1500 acres ; and *Pinus (Tsuga) Brunonianana*, 1000 acres.

Before Webber commenced his exploration work of the Himalaya Forests the *Pinus longifolia* tracts had attracted the notice of the railway authorities. In the autumn of 1863 Mr. Sibley, the Chief Engineer of the North-West Division of the East Indian Railway, had made a tour of parts of the pine forests in the Himalayan Districts of British and Independent Garhwal, having in view more especially the question of being able to obtain a supply of sleepers for the railway in the Province. Early in 1864, as an outcome of Mr. Sibley's Report, the Government of the North-West Provinces addressed the Government of India on the subject of working these forests. Mr. Sibley had been so much impressed with the value of these pine forests and their importance to the railway that he made a proposal on behalf of the Company to undertake the working of some of them. The North-West Provinces' Government agreed to the proposal, and granted to the Agent of the Company a lease for seven years to work a portion of the forests on the Mandagnec, the forests to be worked under the superintendence of Forest Officers.

The North-West Provinces' Government, wishing to avoid complications which might arise if the forests in Independent Garhwal were worked by other parties, suggested to the Government of India the desirability of leasing the deodar and pine forests of Independent (Tehri) Garhwal from the Tehri Rajah. To this the Government of India assented, forwarding

a copy of the lease with the Chamba Rajah as a model to go by. An agreement was come to with the Tehri Rajah, but unfortunately it departed from the Chamba lease in some important particulars. The North-West Government realised this when too late, but the Tehri Rajah at this time was unwilling to execute a revised lease. In the lease entered upon the objections raised were (1) to the limitation of reserved forests to the deodar areas; (2) the language in which the customary rights of the inhabitants were preserved to them.

Towards the end of 1864 the forests were visited by Mr. Williams, Commissioner of the Meerut Division, Mr. Sibley and Captain de Bourbel, Deputy Consulting Engineer for Railways. In consequence of the favourable reports of these officers, an establishment costing 665 rupees per mensem, inclusive of an Assistant Conservator on 500 rupees, was proposed by the North-West Government for the working of these forests under the lease sanctioned. The proposals were approved by the Government of India.

In his Report on his second visit to the forests, Mr. Sibley summed up his observations by saying that the forests contained so much valuable timber, and covered so large an area, that he believed that the entire wants of the East Indian Railway could be met from this source alone for many years to come, if not altogether. Captain de Bourbel's estimates showed that there would be a heavy expense at the outset, but the income of the first three years was estimated to cover more than the expenses to be incurred during the period.

The work of cutting sleepers on a branch of the Ganges was commenced in the season 1864-5. It was intended to creosote the sleepers, and the project was anxiously watched, the whole question involved being the point as to whether the sleepers could be cut, creosoted and put on the railway at a profitable rate. The opinion of the engineers at this date, as expressed on Webber's Reports of the forests, was to the effect that, next to deodar and cypress, the *Pinus longifolia* was more valuable as a timber than any of the other species of trees mentioned in his lists.

The Forest Surveyor next visited the sâl forests of the submontane hills and the Bhabar. His investigations of the condition of these forests fall into the next period of this history. The following extract dealing with this area gives an eye picture of the condition of the forest at the time.
"The great sâl forest covers the dry hot regions of the foot-

hills and the Bhabar, which extends in a belt of from 10 to 20 miles wide the entire length of India, from the Punjab, where it is less developed, right away through the North-West Provinces, Oudh and Bengal to Assam and the Brahmaputra, clothing with its dark, dense foliage the whole of the foot hills up to 3000 to 4000 feet. It is probably the most extensive forest of one particular tree in the world. It grows also, or rather grew—for the woodman's axe has laid low all the fine big timber—in portions of the Central Provinces, etc. Sâl has always been considered in India" (Webber is probably referring to those parts in which teak did not occur) "the most valuable of timbers, even stronger and heavier than teak. It is a dark brown, close-grained, hardwood, with straight interlaced fibre. It is used in the gun-carriage factories for the limbers, and is considered the strongest and most durable timber. It had been so extensively used for building purposes, carpenter's work, and latterly for sleepers, that the great trees, which abounded all through the forests, have disappeared, and nothing remains but saplings and young trees, all growing as close together as possible, their straight black stems and shining green heads forming a complete thicket. Occasionally in the inaccessible places and the steep hill-sides one saw a mature sâl tree. It is a grand, noble stem, straight up with scarce a branch. I have seen some 16 feet in girth, sound and healthy, 60 to 70 feet in height, with straight stems to first branch. It is impregnated with a resinous, highly scented gum, called *ral*, which the natives draw from the stems, which is like pitch, and is put to similar uses."

This description sufficiently indicates that the sâl forests of the region had been subjected in the past to the same merciless exploitation which had ruined so many of the teak forests in the south and in Burma. It also corroborated the fact, already recorded, that the sâl possessed greater recuperative power than the teak, owing to the ease with which the seed germinated.

THE OUDH FORESTS

The information regarding the early operations in the Oudh Forests is very fragmentary and scattered. Fortunately Cleghorn, in reviewing one of the earlier Progress Reports on the forests, wrote a summary of their more recent position.

In 1860 the most valuable of the Oudh Forests, viz. those situated in the Terai at the foot of the hills, were ceded to

Nepal ; a portion of the forests more remote from the hills was retained, but this was of less extent, and the soil was inferior, the trees being smaller in size, and the vegetation less luxuriant than in the ceded forests.

In January, 1861, Mr. Wingfield, the Chief Commissioner, submitted to the Government of India a scheme for the systematic working of the forests within British territory. His proposals were approved, and Mr. F. Read was appointed Conservator of Forests on 15th September, 1861. The first Progress Report was submitted in June, 1862; this contains an outline of proposed operations, with an estimate of the financial results of managing these forests.

Surveys and Maps. The demarcation and survey of the tracts considered worth preserving was then commenced and carried on by the Conservator and Captain J. C. Anderson, of the Revenue Survey. Read first demarcated the forests, and then the professional survey was made. This work was continued during 1862-3 and 1863-4, and was reported to be completed on 1st May, 1864. Detailed maps of the forests had been prepared, and two abstract maps of the districts between the River Sarda and a point east of the Raptee, named Bhagora Tal, comprising about two-thirds of the forests, had been lithographed.

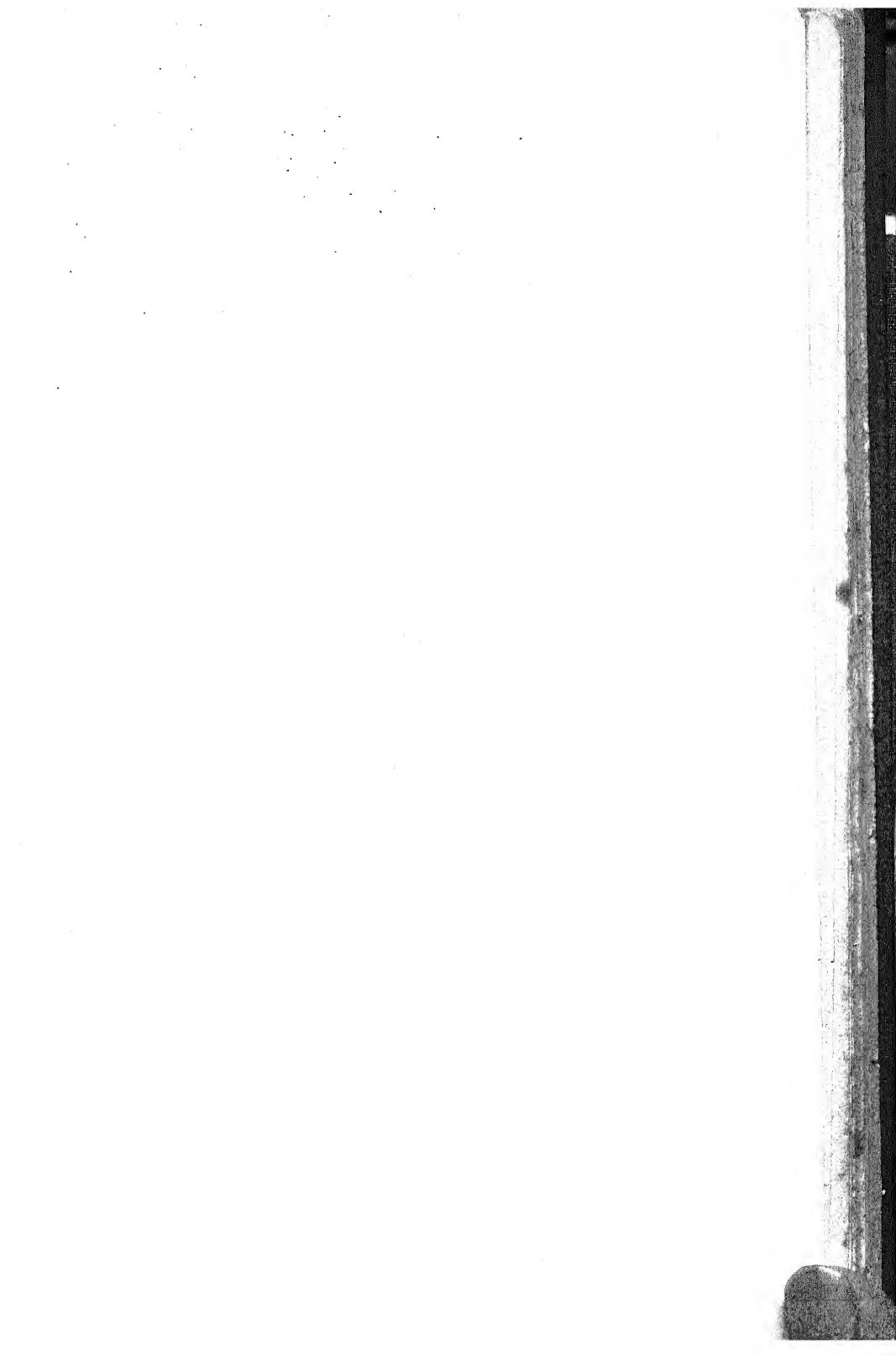
Read proposed the following preliminary measures :

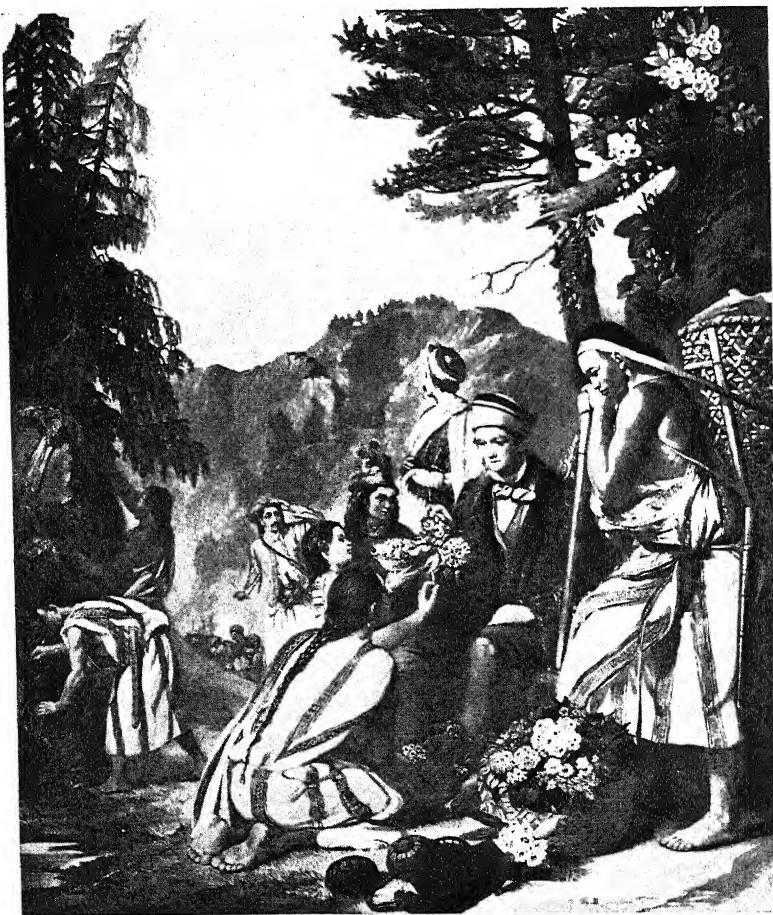
- (1) To work the different forest tracts in succession.
- (2) To clear away creepers which had done great injury to the forests.
- (3) To publish a set of forest Rules.

The timber was to be felled and brought to dépôt for sale on account of the Forest Department. The financial result of the operations in 1861-2, as estimated by Read, was :

	Rs.
Sál timber, at 12 annas per cubic foot	61,735
Expenditure	<u>40,561</u>
Surplus	Rs. 21,174

The value of the stock was considerably overestimated, as may be seen by the actual results of the first three years, given on p. 512.





DR. J. J. HOOKER, F.R.S., IN THE RHODODENDRON REGION IN THE
HIMALAYA MOUNTAINS

*From an engraving at the India Office. Engraved by W. Walker from a picture by
Frank Stone, A.R.A. August 1, 1854*

In April, 1863, a portion of the Oudh Forests was inspected by Brandis, then on deputation. The suggestions of this officer are embodied in two Reports to the Chief Commissioner, one dated 22nd April, treating of the system of accounts and financial results; the other, dated 23rd June, discussing the general measures of forest management to be introduced. These are recorded in Proceedings, Government of India, Public Works Department, July, 1865, Appendix.

At this time also a series of valuation surveys was made by Brandis and Read, in the best stocked part of the forests, situated between the Sarda and Koorialee rivers. The area of sâl trees in this locality is about 150 square miles, or 96,000 acres, estimated to contain upwards of 300,000 first class trees, and a much larger number of second and third class trees.

From observations made in this and other localities, data were obtained regarding the rate of growth of sâl trees, and from these the age of a tree 4 feet 6 inches in girth was assumed to be fifty, and of a tree of 6 feet in girth to be eighty years. Based upon these assumptions, and the estimate alluded to above, it was arranged that, until more complete data concerning the yield of the forests were obtained, the number of trees felled should not exceed 4000 per annum. The forest tracts east of the Koorialee River contained sâl mixed with other trees, but no estimate of their capabilities had yet been made. This work remained to be done.

In Brandis' Report, above referred to, were proposals regarding the erection of boundary pillars, the arrangement of divisions to be worked in succession, the cutting of creepers and thinning operations and the placing of subordinates in charge of different portions of the forest. These Reports were submitted to Government of India by the Chief Commissioner in two letters of the 1st and 4th September, 1863.

Mr. Wingfield expressed his concurrence on all essential points, and orders were subsequently passed by the Government of India with reference to the keeping, rendering and auditing of the Forest Accounts.

On 1st February, 1864, Read obtained leave on medical certificate for eighteen months, and Captain E. S. Wood, 93rd Highlanders, who had been employed on the canals of the North-Western Provinces, was appointed to officiate as Conservator. The season was far advanced, and much of his time being occupied in demarcating the reserved forests, no

THE FORESTS OF INDIA

trees were felled in 1863-4. Partly on this account, and partly on account of the lower rate obtained by the sale of timber, the financial results of the first three years were less favourable than was expected at the outset, viz.:

	Receipts.	Expenditure.	Surplus.	Deficit.
	Rs.	Rs.	Rs.	Rs.
1861-2 .	4033	38,131	..	34,098
1862-3 .	59,295	58,812	483	..
1863-4 .	92,245	38,803	53,442	..
Total .	1,55,573	*1,35,746	53,925	34,098
	Surplus	19,827	Surplus	19,827

The timber on hand on 30th September, 1864, was valued at 84,122 rupees; if this sum be added, we have:

	Rs.
Receipts	1,55,573
Stock	84,122
Total	Rs.2,39,685

This valuation of stock was at the rate of 50 rupees per 100 cubic feet, whereas Read's valuation of stock on 30th September, 1862, was at 75 rupees per 100 cubic feet.

The expenditure during the same period was:

	1861-2.	1862-3.	1863-4.	Total.
	Rs.	Rs.	Rs.	Rs.
Timber expenses . .	20,883	41,125	11,918	73,926
Bridge over Sardah .	..	..	6206	6206
Survey demarcation .	3621	2991	3525	10,137
Establishment . .	15,881	17,687	17,162	50,730
Total . .	40,385	61,803	38,811	1,40,929*

* The lower figures, received at the Inspector-General's Office, do not accord with the upper statement taken from the Administration Report for 1863-4. The discrepancy should be explained.

By sale of timber in the first three years, 83,543 rupees were realised ; thus the working charges and revenue on this item stand as follows :

	Rs.
Sale of timber	83,543
Stock in hand, 30th September, 1864 .	84,122
	<hr/>
	1,67,665
Timber charges .	75,284
	<hr/>
Surplus on account of timber operations	Rs. 92,381

This does not include the value of timber in transit or outstandings, which are believed to have been considerable.

In June, 1862, Read estimated the timber expenses at 6a. 8p., and the amount likely to be realised at 12a. per cubic foot all round. It was subsequently found that the expense could be reduced to 4a. 2p., but that the average amount realised was not likely to rise much above 8a. per cubic foot. Assuming these rates, without fractions, 4000 trees, at 50 cubic feet each, annually would yield the following revenue :

	Rs.
Receipts—200,000 at 8 annas per cubic foot .	1,00,000
Expenditure—200,000 at 4 annas per cubic foot	<hr/> 50,000
Surplus in timber operations .	Rs. 50,000

This yield had not yet been attained. The amount of timber brought to dépôt during the first year was only 75,000 cubic feet ; during the second year something less ; and none during the third year, the operations having been interrupted by the Conservator's departure on sick leave.

There seemed every reason to believe that in the future the revenue above estimated would be annually realised ; in 1865-6 it only fell short by 4000 rupees, and it was confidently expected that it would rise as the price of timber increased. It was also expected that the revenue from grazing dues and miscellaneous forest produce would expand, and balance the expenditure on account of establishment and conservancy proper.

CHAPTER XXVII

FOREST OPERATIONS IN BENGAL AND ASSAM, 1858-1864

BENGAL and Assam, or the "Lower Provinces," to give them the name by which they were also designated at this period, had paid but scant attention to the conservancy of their forests prior to 1863. Throughout the century which had almost elapsed since we had taken over the administration of the Province, Calcutta had imported its timber from the forests of the north and from Burma. And the other large towns had obtained their requirements by exploiting local resources and importing produce from such forests as were accessible by water transport. Prices of both timber and fuel had greatly increased with the gradual disappearance of material from areas which had been entirely cut out, and those in authority had at length come to the conclusion that some attempt must be made to follow in the footsteps of other Provinces in India and introduce some measure of conservancy to remedy the evils of over-exploitation and to safeguard the existing forests from total destruction. It has been mentioned that Brandis, on his way from Burma, to join the Government of India headquarters, was requested to visit Bengal and report on the forests and on the lines on which conservancy should be introduced into the Province. Brandis made a tour through part of the forests and discussed the question of a future policy with Dr. T. Anderson, the Superintendent of the Botanic Gardens in Calcutta, towards the end of 1862. Brandis drew up a note of his proposals, dated 18th December, 1862.

In January, 1863, the Government of India requested the Bengal Government to give its attention to the conservation of the forests under its jurisdiction, and to "favour us with its views as to the best course to be adopted in placing this branch of the administration on a more efficient footing."

The preliminary steps which were taken in this direction

will be described, but the major portion of the very interesting information obtained on the subject of the forests, both in Bengal and Assam, falls within the succeeding period, 1865-70. The data collected give us a very clear exposition of the position of the forests of this region at the time, and we owe it to Dr. Anderson that so valuable a record is extant.

The Bengal Government had entrusted to Anderson the work of carrying out the preliminary enquiries and investigations into the forests. These were confined to an inspection of the forests in the north, i.e. in the Eastern Himalaya, including Sikkim, in which Hooker had travelled and compiled valuable botanical reports; and to some slight extent the belt of sâl forests in the Terai and Duars at the foot of the hills.

Military operations were being carried on at the period in Bhutan to the east. This little war gave us an area of valuable forest on the east bank of the Tista River. It originated as follows: Trouble had been experienced from the Bhutanese. With the object of coming to an amicable understanding a Mission left Darjiling for Bhutan on December 4th, 1863. The Mission returned on April 12th, 1864, "having been not only received without honour, but also even subjected to insult and outrage." War was the inevitable consequence, and it interfered to some extent with Anderson's first year's work and proposals. As a result of this war the southern portion of the mountains and the Bhutan Duars at their foot came under the jurisdiction of the British. These operations had not been completed, however, by the end of 1864.

As an outcome of Anderson's preliminary proposals on the subject of the introduction of conservancy into the forests of British Sikkim he was temporarily appointed, in September, 1864, Conservator of Forests of the Lower Provinces for a period of two years, whilst continuing to hold his permanent post as Superintendent of the Botanic Gardens in Calcutta. Bengal thus followed in the footsteps of Bombay in appointing as its first interim Conservator a Superintendent of Botanic Gardens. But in this case, and in the light of the definite views now held on the imperative need of appointing whole-time officers whose whole energies should be devoted to the work of forest administration and conservancy, this appointment was only confirmed with reluctance by the Governor-General in Council. They wrote in this connection to the Secretary of State: "To admit, however, of the process of

organisation being continued, we confirmed the appointment by the Government of Bengal of Dr. Anderson to be Conservator, and sanctioned an office establishment for him. We considered that it would be preferable to have a separate Conservator, who would devote his whole time to the forests, but being aware that Dr. Anderson's special knowledge would be particularly useful in starting a system of Conservancy, we have assented to his holding the post of Conservator for one year, on an additional allowance of Rs.250 per mensem."

Dr. Anderson's first Memorandum of October, 1864, detailing his proposals, was based on the note which had been drawn up by Brandis as the outcome of their joint consultation on the subject. It chiefly dealt with establishments and the steps which he proposed for carrying on the work of the Botanic Gardens. These latter were in effect that his chief assistant should replace him there, and also deliver the course of lectures given at the Medical College, Calcutta, by the Superintendent of the Gardens, who was *ex officio* professor of botany at the College. The emoluments suggested for the Head Assistant in connection with these proposals were not sanctioned by the Government of India.

In his Memorandum Anderson stated that he had drawn up a tolerably full Report on the forests of British Sikkim, and the details of conservancy which he proposed to adopt in them. To enable this administration to be introduced he asked that an Assistant Conservator should be appointed on a salary of Rs.400 per mensem. An overseer for the temperate forests of Sikkim on Rs.100 a month would also be required, and a second on a similar salary for the forests of the Terai, with a free house to be situated "in some of the healthy parts of the Terai, probably at Siliguri."

Anderson's ideas at this period on the subject of these forests are outlined in the following remarks: "I cannot decide on the necessity of this second appointment until I inspect the sâl forests of the Terai in January (1865). If plantations of mahogany and sissoo are to be formed in the Terai, an overseer must be put in charge of these at least for the first 3 years after their completion. . . . Should I find that the timber of the valuable sâl forests of the Great Rungeet can be removed with facility to the banks of the river, and that during the rains sâl sleepers fastened to sleepers of *Pinus longifolia* can be floated into the Tista, and down that river to some point between Sivok-Gola and Jalpaiguri, it will then

be necessary to procure two overseers to superintend the working of the forests. These points can only be decided by experiments made during the rainy season of 1865. If the experiment succeeds a large revenue will be immediately derived from the sâl forests of the Great Rungeet. To enable me to make this experiment, I shall require the services of an overseer to superintend the felling and sawing-up of trees to provide 1000 sleepers of sâl with a corresponding number of sleepers of *Pinus longifolia* to float them." (It may be remarked here that sâl timber will not float.) "These sleepers should all be prepared in the cold season, so as to be ready to be floated down the Rungeet and Tista as soon as these rise to their rainy season level. The question to be decided by this experiment is, can timber be profitably floated over the rapids of these rivers during the rainy season, when the rapids almost disappear?"

Anderson's plan, as above outlined, was a bold one; as all acquainted with the rocky nature of the beds of the rivers in question and the unhealthy climate of the two valleys during the rainy season will readily admit.

In recommending Mr. Gustav Mann to the suggested post of Assistant Conservator, Anderson mentions the valuable cinchona plantations which had been commenced by the Superintendent of the Calcutta Botanic Gardens in the Sikkim Hills many years before. Mr. Mann, an officer who had carried out explorations in West African Forests under the orders of the Admiralty as a successful botanical traveller before he arrived in India, was at the time the head gardener in charge of the cinchona cultivation in Darjiling, the hill station and sanatorium of Bengal, situated at some 6500 feet in this part of the Himalaya. Anderson proposed that Mann should continue to have general superintendence of the cinchona plantations, of which he had gained valuable experience, in addition to his new duties, and that his appointment as Assistant Conservator should be temporary until he had passed a colloquial examination in Hindustani. As actual incumbent at the plantations he proposed to appoint a Mr. John Scott, who was to shortly arrive, "a gardener sent out to me by Dr. Hooker and Mr. Darwin, both of whom recommend him as a person of superior attainments." Anderson proposed that these appointments should be made from December 1st, in order that a commencement might be made with the conservancy of the temperate forests, and the

enforcement of the Rules which had been drafted with reference to the cutting and sale of firewood, timber for charcoal, and other local purposes. Should his contemplated visit to the Rungeet and Terai sâl forests prove successful, he proposed that Mann should then commence the work of felling trees and preparing the 1000 sleepers to be floated out the following rains.

The establishment outlined for undertaking the suggested conservancy and working proposals, including portion of the salary of the Head Assistant at the Botanic Gardens to be credited to the Forest Department, amounted to a sum of Rs.4128 per mensem. This total also included a small establishment for the forests of the Bhutan Duars, in which military operations were still being carried on, and an establishment for the Assam Forests.

On the subject of the Assam Forests, Anderson wrote, in December, 1864 : "The question of forest conservancy in Assam is not settled, and cannot be until I can fully examine the forests of that Province. Judging from the Reports submitted by the Commissioner of Assam, it appears to me that while there are valuable forests to preserve, still little revenue beyond what will be yielded by local sales of timber can be expected from the forests of Assam. I would, therefore, recommend that these forests should at first be entrusted to an Assistant Conservator on a salary of Rs.400 a month, including house rent." He also recommended the appointment of two overseers on Rs.100 with free house, a small local office establishment and "a small native establishment to work the forests."

The Government of India cut Anderson's proposed monthly expenditure on establishments down to Rs.538 from the suggested Rs.4128.

Mann's appointment was sanctioned, as also, the Conservator's office establishment in full ; but the proposed Sikkim Forest staff was reduced. The Bhutan staff was disallowed until such time as the military operations came to an end, and the Assam proposals until the Conservator had been able to personally visit the forests and submit a Report on their possibilities.

The Revenue Survey of British Sikkim had not been completed at the end of 1864. For this reason Anderson found it impossible to "give an accurate statement of the extent of the forests belonging to Government in that district. From

my general knowledge of British Sikkim, and frequent examination of the map of Sikkim so far as completed, I am able to submit the following approximate statement of the extent of the Government forests, which, I believe, will be found to be tolerably correct."

This account was drawn up at the end of 1864, and forms a fitting termination to the review of the position and knowledge on the subject of the Bengal Forests at this time. Anderson's description of the Terai and hill forests of Sikkim is as follows :

" *The Terai.* The extent of this portion of the district may be estimated at 80,000 acres, of which about 25,000 acres consist of forests. The valleys of the tropical rivers of the Tista and Great Rungeet are filled with sâl forest. Since the annexation of the Bhutan Duars, both slopes of the Tista Valley have become British territory. I have carefully examined the Sikkim side of this valley, and find that it is rich in sâl. The portion of this valley which is British territory, that is, from the Terai to Independent Sikkim, at the junction of the Great Rungeet and Tista, is almost twenty miles in length. This gives about 30,000 acres of forest. The recently annexed slope of the river in Bhutan contains a much finer sâl forest than that existing in the British Sikkim side of the valley. From its geographical position, this forest must be worked by the officer in charge of the Sikkim Division. The entire valley is the property of the Government.

" The sâl forests of the Great Rungeet are, with the exception of about 200 acres, entirely the property of the Government. The forest is not less than 12 miles in length and extends to 2500 feet above the rivers. The northern slope of this valley is entirely covered with a valuable forest of sâl and *Pinus longifolia*. It is situated in Independent Sikkim, but I have been informed by Tehelm Lama that the right of working this forest might be obtained from the Raja of Sikkim on favourable terms."

" The temperate forests of Sikkim comprehend all the territory of British Sikkim above 6000 feet, and has all been reserved for forest purposes since the notification dated 14th December, 1864. I estimate its extent at 600,000 acres. The forests of this region contain a large amount of valuable timber belonging to several species of oak, chestnut, magnolia, *Bucklandia*, *Cedrela* (tun), maple and walnut. The timber from these forests will be easily transported by means of the cart road."

The road here alluded to by Anderson was the Tista Valley road running down to Silliguri in the plains.

Anderson appended the following statement to this Report :

Approximate Tabular Statement of the Nature and Extent of the Government Forests situated in the District of British Sikkim.

Class of Forest.	Probable area in acres.	Species of timber-yielding tree in Forest.
Forest of the Terai . . .	25,000	Sal, Sissoo, Chilauni (<i>Schima Wallichii</i>) Gumber (<i>Gmelina arborea</i>). Sal, Chilauni, Tun.
Forests of the Tista Valley in Sikkim and Bhutan .	16,000	
Forests of the British por- tion of the Great Run- geet	4,000	Sal, Chilauni, Tun, <i>Pinus longifolia</i> , very rare, abounding on the oppo- site bank of the river in Independent Sikkim.
Temperate Forest of Brit- ish Sikkim	60,000	2 species of Oak, 1 of Chest- nut, 6 of Magnolia, Maple, Walnut, and <i>Bucklandia</i> .
Total forest acreage .	105,000	

CHAPTER XXVIII

THE OPINIONS OF THE GOVERNMENT OF INDIA AND THE SECRETARY OF STATE ON THE VALUE OF THE FORESTS, 1862

A N endeavour has been made in the preceding chapters to trace the history of the forests in the different parts of India, so far as this has proved possible, during a period of approximately seventy years. The recognition of the value of the forests and of their importance to the general welfare of the community and the country as a whole, had been of very gradual growth. The realisation had not yet been achieved in some parts, whilst in others it was still questioned by the officials. Amongst the population, speaking generally, the value of the forests and the necessity of their conservation had received no recognition. That both the Secretary of State at home and the Government of India had become fully alive to the importance of the forests and imbued with the conviction that the introduction of a systematic conservancy was a work of immediate importance is evidenced by the two Despatches transcribed below, which form a fitting termination to this volume.

Some correspondence had taken place as to the Department of the Government of India under which the management of the forests should be placed. The Government of India had placed it under the Public Works Department on the grounds that that Department had the chief interest in the utilisation of the forests, a contention borne out, it is true, by the previous sixty years' operations in the forests. As the Secretary of State correctly pointed out, however, "the interests of the Public Works Department lie rather in procuring timber for present use than in preserving future supplies of the article." The Government of India explained that there was no separate Revenue Department in their Government. That unless placed under the Public Works Department the Forest Department would be under both the Home and Foreign Departments.

It would be inconvenient to place the new Department under the Home Department alone, as the mass of the forests were in the Non-Regulation Provinces. That if placed under the two Departments there would be divided control, which would be objectionable. The connection between the Forest and Public Works Departments would be a merely nominal one, no control being exercised by the officers of the Public Works Department over the Forest Officers or their management of the forests. In view of this explanation the Secretary of State reluctantly agreed to the proposal, stipulating that the new Forest Department should be strictly enjoined to act in concert with the Revenue Department, and that papers in connection with forest matters sent home should be marked "Revenue Forests" in addition to "Public Works."

The Despatch from the Governor-General in Council to the Secretary of State on the subject of the forests is dated 1st November, 1862, and (omitting a few paragraphs irrelevant to the matter in question) is as follows :

" It will be convenient in the first place to refer briefly to the past history of forest administration by the Government of India, and to point out the steps by which matters have been brought to their present position. As to Madras and Bombay, no sensible interference with forest management by us takes place. Both of these Governments have an organised forest administration, but regarding this nothing need be said here, as it is not our present wish to suggest any change in regard to those Presidencies.

In Bengal till now (1862) nothing has been done in the matter of forests, and a sufficient commentary on the results of this neglect will be found in the fact that it is still necessary to import railway sleepers from Norway, because the available supply of suitable timber from indigenous sources is too costly or too small. Quite lately a proposal has come from the Bengal Government to appoint an officer to inspect the forests of Assam, with a view to determining what should be done with them, but we regret that we have not been able to name a qualified person for this duty. It appears that hitherto a certain revenue has been derived in that Province from licences to fell timber, but no regular system has been established. No doubt much the same state of things obtains in the other forest tracts of Bengal.

In Burma the importance of the forests has long been recognised. From the date of our first acquisition of the Tenasserim

Provinces the value of the teak timber exported from Moulmein was apparent. The late Mr. J. R. Colvin commenced the organisation of a Forest Department as long ago as 1847, when he was Commissioner of those Provinces; and since Dr. Brandis, the present Superintendent of Forests, has been in office, a period of seven or eight years, a steady improvement in the state of the Forest Department in the Burmese Provinces is believed to have been made, as well in the system of administration as in the net money return obtained by the Government, and in the supply of timber rendered available for the public.

In Oudh a Superintendent of Forests has been appointed since the reoccupation of that Province; from the latest information before the Government he is engaged in fixing the boundaries of the tracts of forest that are to be preserved and in preparing for their survey, which is going on at the same time.

In the North-Western Provinces the difficulty of obtaining timber has been painfully felt for the last fifteen years or more, but the administration of the forests there up to the time of the mutinies was a melancholy failure. A superintendent was appointed in 1854 to the charge of the forests in the Dehra Dun and the west of Rohilkund, the result of whose bad management was the completion of the ruin of almost all the forests that still contained good-sized trees. At present the most important part of the North-Western Provinces Forests is under the direct management of Lieutenant-Colonel Ramsay, the Commissioner of Kumaun, who has at last introduced order into the administration. But he works on the wreck of the forests, and it will take many years to restore them to a proper condition.

In the Punjab it is believed that there is no timber of any appreciable value, except on the mountain slopes within the Himalaya, and the tracts which contain timber are shared between the British Government and Native States. Dr. Cleghorn from Madras is now engaged in visiting these forests, and his Report to the Local Government may be expected soon.

In the Central Provinces a superintendent was appointed in 1860, and it is hoped that matters are in train there to prevent further deterioration, and the development of this part of the resources of those districts; but here also all operations are based on almost ruined forests.

In the Hyderabad Assigned Districts, attention has been directed within the last two or three years to the necessity of preserving the forests, and it is understood that a system of conservancy is in course of being matured by the local authorities. The high prices of timber, and scarcity constantly complained of by Public Works Officers in these districts, prove the general deficiency of trees.

From the Straits Settlements no questions relating to forests have come before the Government of India. In Mysore some first steps have been taken to establish a system of conservancy, but they call for no special comment.

It will be understood from this account that until quite the last few years no forest administration has in truth existed. Occasionally questions arose as to the proper system to follow, but they were taken up in that Department of the Government of India to which they happened to be referred, and without any methodic or systematic policy. Hence at one time or place, forest management has been directly assumed by the Government, and at others the idea has prevailed that it is to private enterprise that the Government should look for the successful working of the forests of India. But so long as the supply of timber in the country was generally sufficient for the public works in hand, the question of forest management did not present itself to the Government as one calling for earnest consideration. Latterly, however, while the supply of timber has been steadily diminishing from want of proper conservation, the demand both for State and private purposes has been rapidly increasing, and the enormous requirements of the different railways for sleepers has especially brought the matter into very prominent notice, and has now made the subject of forest conservancy an important administrative question.

It is in this manner then that the connection between the forests and the Public Works Department has arisen. The requirements of this department for Government works in the North-Western Provinces first became so difficult to meet that, as before noticed, a superintendent was appointed to look after the business ; he was a Public Works officer. Then the gradually increased demand for sleepers, which has naturally been considered in relation with the railway administration, led further to matters connected with forest management being frequently brought under consideration in the Public Works Department, in which the railway business is

transacted. The tendency to shift the consideration of forest questions into that Public Department which is most directly interested in the supply of timber, and to which all complaints come regarding the failure of the supply, was inevitable. In like manner the pressure thus exercised had caused the officers of the Government connected with the Public Works administration to be more alive than others to the real importance of the points at issue, and superintendents of forests or timber agents were from time to time appointed to assist in providing for definite or pressing wants. At length the Government of India perceiving the great and increasing importance of dealing with its forests in a more regular manner, and of concentrating the administrative control, which till then had been exercised in a feeble and desultory manner in all the Civil Departments, resolved to bring the consideration of all questions relating to forests before it, in one only of its departments, and selected for the purpose that of the Public Works, as being the one that actually had most frequently to deal with such matters, and that practically was most deeply interested in successful forest management.

And here it may be remarked that, although we spoke of the executive management of the forests having been under the Home or Foreign Departments, according as they were situated in regulation or non-regulation Provinces, in truth the substantive control, such as it was, has been also shared by the Financial Department; the late transfer of the duty to the Public Works Department was so far incomplete that the administration of the funds was still allowed to rest mainly with the Financial Department, and not merely to the extent exercised by the latter in regard to all branches of the public expenditure, but also as to details. Thus questions connected with the general administrative management of the forests are now disposed of in the Public Works Department, and individual appointments are made in it also, but the accounts of expenditure and the grant of funds for the service of the Forest Department are not dealt with in the Public Works Department, which, indeed, has till now taken no cognisance of such matters; they are considered with the general estimates of the revenues, and without any special reference to administrative projects or wants.

The first conclusion to be drawn from the foregoing statement of the present condition of things, seems to us quite unavoidably to be, that before discussing the question of the

department of our Secretariat in which forest business should be dealt with, the far more serious one presents itself for consideration of how we may best secure the development of some real system of administration, for at present it is certain that nothing deserving the name exists. And the necessity of having the forest business placed on a definite footing, and of arranging that all matters connected with it shall be dealt with in one department, whatever that department be, seems obvious. The same agency which directs the executive management of the forests should also control the financial operations and results, subject only to such general check as is exercised by the Financial Department on all other expenditure. Such a divided responsibility as has been till now permitted to exist would in itself be sufficient to account for all past failure and neglect, and we feel confident that the first step in real improvement must be the concentration of authority and responsibility.

It will be useful if we here note some of the general principles that should, as it appears to us, be accepted in laying the foundation of a system of forest administration for India. We shall then more clearly lay before you the tendency of the measures that we advocate, and more perfectly enable Her Majesty's Government to correct us if our conclusions are on any point not admitted to be sound.

And in the first place we may express our belief, that under no conceivable circumstances is it possible that personal interests can be made compatible with public interests in the working of forests, otherwise than under a system of such stringent supervision as would, in fact, reduce those working under it to the position of mere agents of the administration. The length of time required for maturing a growth of timber is so great that no individual can have a personal interest in doing more than realising the largest possible present amount from any forest tract of which he may get possession. In fact, timber is produced of which no man can expect to get more than one crop in his lifetime, and the sooner and more completely he realises it the better. The moral or social restraints that are likely to operate to prevent such a course are most especially wanting in India, whether we deal with natives of the country or European settlers. Therefore, we think that the idea of giving a proprietary right in forest to any individual should be abandoned, as the possession of such a right is almost certain to lead to the destruction of the

forest ; personal interests, in short, under existing conditions and in this respect, are not only incompatible with public interests, but they are absolutely antagonistic.

We consider also that all Government forests should be strictly set apart, and made unalienable ; of course, where private rights already exist, or where in the case of the forests of Burma certain rights have been conferred on private parties for a limited time, they must be respected, though it might be good policy to extinguish such rights on equitable terms, whenever it be found possible to do so.

It appears especially important, at the present time, when the subject of the disposal of waste land has been so prominently brought forward, to mark out and fix the boundaries of the forests which it is determined to conserve, so that it may be definitely determined what is forest, and what is waste land, available for sale. We are sensible that the fact of the existence of a forest in India is, in many cases, at least *prima facie* evidence that the land so occupied is not fit for any other purpose, and it is, therefore, necessary to be very careful about the disposal of waste land containing forest tracts, until it be clearly ascertained that such land is susceptible of being brought under cultivation, that the grant is applied for this purpose, and that it is on the whole better to give the land up to be reclaimed than to preserve it as a forest. We annex a circular that has recently been issued from the Home Department on this subject.

Of course, it cannot be said that any forest which is now thought to be necessary, or worth preserving, will be held to be so for all time ; but the facilities for the destruction of forest are so great, the difficulty of reproducing it so insurmountable, and the general tendency in this country to accept as truth the fallacy that the clearance of forest is of itself necessarily an improvement so common, that it will be important to record forest boundaries, and to set forest land apart in a very strict and formal manner, and it seems even possible that the object might be best attained by an Act of the Legislature. But the exact way of doing this must be a matter for further consideration.

Having thus secured, as far as possible, that the boundaries of those forests shall be respected, which it is intended to preserve, and having obtained maps and surveys of the whole of them, a solid basis would be got on which to establish an efficient forest administration, the great end of which should

be to obtain the largest possible quantity of produce from the forests, consistent with their permanent usefulness. The conditions under which this would be possible would probably be very various in various places, and success could only be looked for as the result of experience, and careful and continued experiment brought to perfection under local management, but under some central control, or system of inspection.

When the forests are once removed out of the category of waste land, and dealt with as a special State domain, there will be a very great step made in advance in obtaining for the forest administration a better defined position. The circumstance that forests have till now been reckoned as waste, and their produce treated as miscellaneous revenue, could not fail to be pernicious, and has very probably conducted no little to the present state of things. A primary object to a collector of land revenue is to remove land from the class that pays no revenue to that which pays, and his tendency will be to sacrifice forest for cultivation. The idea that forest is a thing valuable in itself, and, in truth, just as essential to the community as fields of wheat, sugar or cotton, took a long time to spring up, and, in fact, is not even now generally realised in that complete manner that is essential before forest management can be said to stand on a proper basis. The forests, when set aside as such, should be made to assume a distinct plan of their own in the departments producing revenue, and the success or failure of the administration should be made at once apparent from the state of the balance on the forest budget.

In order to carry out in at all a satisfactory manner such a scheme as we have here sketched out, it will in our opinion be quite necessary that some special officer should be placed in charge of the business. It is not possible for us to say, in this stage of the matter, precisely what form the appointment should take; but probably it should be that of an Inspector-General, or Controller-General, of Forests, who should be directly under the orders of the Government of India, and whose business it would be to advise them on all questions connected with forest administration, and generally to introduce a thorough system of management and conservation throughout all the forests in the territories under the Government of India. He need not be invested with any power of direct control over the forest management under the local governments, to whom all instructions on such matters might

still issue through one of the branches of the Secretariat of the Government of India, as at present. His essential duties would be to devote his attention to the requirements of the forests, and by help of occasional tours of inspection to enable the Government of India to take advantage of his personal knowledge of the exact facts in correcting local errors, or supplying suggestions for local improvement, based on his extended general experience. The special appointment of such an officer to assist the Government of India in dealing with the highly important forests of Burma, Oudh and the Central Provinces, all of which are directly administered by the Governor-General in Council, would in itself be desirable, and no risk of any objectionable interference in details in the Provinces under the Lieutenant-Governors seems to us at all likely to be incurred, if his functions were extended in the manner proposed.

As a first step towards carrying out these important objects, we have determined to summon Dr. Brandis from Burma, and to place him temporarily under the orders of the Government of India. Dr. Brandis, as you are well aware, is peculiarly fitted for such a duty. But, in the first instance, he will have to consider the existing state of the forests in different parts of the country, and to submit for our further consideration his views of the best plans to adopt for the purpose in view. It is not probable, therefore, that we shall be in a position to sanction the establishment of any definite mode of forest procedure, or the formation of a regular Forest Department for some time to come; in the meantime, we are not committed to any particular course, and before taking further steps we shall doubtless have an opportunity of learning the views of Her Majesty's Government on this important subject.

We may add that it seems to us that as an officer will be specially required for the general control of forests under the Government of India, so also there should be for the several Provinces chief local superintendents, such as Dr. Brandis is now in British Burma. In the minor administrations, where the nature of the forest tracts permits of the work being concentrated, the principal executive officer may readily be general superintendent also. But in a Province like Bengal, or in the North-Western Provinces, this could hardly be. The local Governments may probably be best allowed gradually to feel their way to some regular organisation, but of the

necessity for system we have no doubt. It is true that occasionally a vigorous control may be exercised over the forests by a local revenue officer, as has happened in the case of the Kumaun Forests, where the administration of the Commissioner, Lieutenant-Colonel Ramsay, has been in a high degree successful. But such matters are not in their nature an essential part of his duties, and it is indisputable that when the success of the management of such a business is due to the special qualifications and peculiar zeal and activity of an individual officer, a change that removes him is but too likely to be followed by serious deterioration of system. Organisation to be of real and permanent value must not be essentially, or even mainly, dependent on extraordinary personal acquirements or activity ; the machinery should be such as will work with average men under the direction of the best of their class. And this is peculiarly the case as regards the administration of forests. Results will be so long in coming, and ruin is so easily and so immediately brought about by the neglect of first principles by a single individual, that as little as possible should be left open to the local executive authorities in this respect."

The Secretary of State's reply is as follows :

"The principles laid down by you, in regard to the treatment of the forests, seem to me to be correct, and I cordially concur in most of the recommendations by which, in your letter No. 75, now before me, you propose to apply a remedy to the existing evils, and to place this branch of administration on a sound and permanent system.

It is very evident, as you state, that the want of system hitherto existing in all parts of India, but more especially in the Bengal, North-Western and Central Provinces, has been one of the chief causes of the waste and destruction to which the forests have been subjected. It arose, no doubt, from a want of due appreciation of the real value of the forests to the empire. In Burma and Tenasserim, where the late Mr. Colvin began the organisation of a Forest Department, the evils arising out of a want of system, although they too often obtained, have been mitigated, wherever the Chief Local Superintendent has been a person with such qualifications for the post as Dr. Brandis possesses. But, even in that case, there must be always much to contend with from the demands of private interests, and throughout India also, and particularly of late years, from the growing wants of public

departments for timber for the execution of public works. And, as you justly observe, the organisation, to be of real permanent utility, must not depend mainly or essentially on extraordinary personal acquirements or activity, but the machinery must be such as will work with average men, under the direction of the best of their class.

The present state of the forests, however much to be regretted, is not surprising in a country where forests were abundant, though difficult of access, where timber was in no great demand, and where, on the other hand, land was in great demand for cultivation. Most countries of the world have suffered from similar neglect; and the results have shown themselves, not only in the dearth and consequent high price of timber, but very often in the deterioration of climate, and in the barrenness of land formerly culturable, if not fertile, situated at the base of hills, when these have been stripped of the forests which clothed them, condensed the vapours into rain, and gave protection to the country below them. The subject, however, has of late been more considered, and the conviction has been arrived at, that it requires the stability of a settled administration to prevent the present destruction of forests, and hand them down in such quantity and conditions as to leave a due supply for future generations. A permanent Government only can be expected to wait long enough to reap the profit obtainable from an article which it takes eighty or a hundred years to bring to maturity. Permanency, as far as it can be obtained, is, therefore, of the highest importance in any arrangement for the due administration of forests. And Her Majesty's Government, therefore, entirely approve of your proposal to make a separate department at Calcutta for the control of all questions relating to forests in the Provinces directly administered by your Excellency in Council. Under the chief officer, whatever designation you may fix on for him, should be superintendents in each Province, to whom should be entrusted considerable latitude in the execution of the Rules laid down, although he should be bound to adhere strictly to the general principles promulgated by the chief officer at Calcutta. But as regards the Provinces under the administration of the three Lieutenant-Governors respectively, upon which you appear to entertain some doubts, it appears to me desirable that the responsibility of practical management should be left in the hands of these officers, under such general Rules as you may see fit to lay

down, the Inspector or Controller-General of Forests exercising no direct authority, but acting generally as your adviser, and through you of the several Lieutenant-Governors ; and Her Majesty's Government are decidedly of opinion that the forest administration of Madras and Bombay should be left, as at present, under the orders of the Governors of those Presidencies.

It is very satisfactory to me to learn that you have come to the same conclusion as Her Majesty's Government, that individuals cannot be relied upon for due care in the management of the forests, inasmuch as private interests must be opposed, in this instance, to the public interests.

Your circular, cautioning the local Governments to be careful that forests are not treated as waste lands under the new arrangement, has received my approval in Despatch, No. 23, of the 17th December last. I quite agree with your Excellency that it is very important that, in order at once to remove the forests from the category of waste lands, their boundaries should be established and set apart in some strict and formal manner ; but I would suggest to you whether a legislative enactment will be necessary for this object. It occurs to me that inconvenience may arise from such a step, inasmuch as you admit that it may be found desirable to give up land to cultivation which may have been set apart for forests, and *vice versa* ; and it seems to me that such questions would be best resolved by your Excellency in Council, acting on the recommendation of the chief officer of the Forest Department, and in concert with the revenue officers of the district in which the land is situated.

With reference to other clauses in your letter, Her Majesty's Government think that the control of the financial operations, as well as the provision of proper means of conveyance to connect the forests with the great lines of traffic through the country, should be wholly vested in the Forest Department.

Whilst alluding to financial considerations, I will observe that, although it is of course to be hoped, and although I firmly believe that a considerable profit will be derived from the forests, when permanently placed under experienced and careful management ; still, profit is not the only object to be kept in view, and in the state in which many of the forests now are it may not be possible at once to obtain a revenue from them. An outlay, even, may now be necessary in many

instances, and, when necessary, should, I think, be incurred. And it is another advantage of a permanent administration that it will look forward with certainty to the repayment of such an outlay in future years. I may add, too, that the superintendents should be supplied with a sufficient staff, or it will be impossible for them, and particularly at first, to enforce the Rules and give efficient protection to the forests under their charge.

Your review of what has been done in regard to forests in the districts under your own superintendence, and in those under the local Governments in more immediate connection with your Government, does not call for detailed observations from me. I will, however, remark that I trust no delay will take place in complying with the request of the Lieutenant-Governor of Bengal, for the selection of a competent person to inspect the forests of Assam, and the other forests under that Government. With respect to the Straits Settlements, also, inquiry should, I think, be at once set on foot to ascertain whether they do not possess forests which it would be worth while to preserve. I await, with interest, Dr. Cleg-horn's Report on the forests in the Punjab, and the North-Western Provinces. I am aware that, in this part of India, the forests of the Government have been especially neglected, and that what remains are chiefly in the hands of private persons; but unless the forest land has been entirely given up to the plough, there may, I hope, be still some portions of the various forests which care and rest may again render serviceable for the production of timber and firewood. The provision of this latter article will, I do not doubt, not escape the attention of your Government, the demand for it, especially in the neighbourhood of hill stations, has much increased, and is likely to continue large in the present difficulty of obtaining coal in India.

The step taken by you, of summoning Dr. Brandis from Burma, that you may have the benefit of the experience and knowledge of an officer so well qualified to give sound advice as to the arrangements required on this important matter, was most judicious."

These two Despatches inaugurated the birth of the Forest Department in India. In a second volume it is proposed to trace the development of the Department, and with it the great improvement in the Forest Estate which resulted during the next sixty years, from its having been placed in the hands

of a highly trained scientific body of Forest Officers—work which has proved most beneficial to the people and the country, whilst it enabled the Forests of India to play their part in a striking and efficient manner during the Great War.

In concluding this review of the history of the forests down to 1864, Indian Forest Officers would wish to have recorded their indebtedness to the Superintendents of Botanical Gardens and other officers of the Medical Service in India. For these Officers did much, by inspecting and reporting on the forests, preparing lists of forest trees and drawing attention to the destruction which was taking place, to pave the way for the introduction of proper Conservancy.

END OF VOLUME I

GLOSSARY OF INDIAN WORDS

Ainee or Ayni=*Artocarpus hirsuta*

Akbari Department=Land Revenue Settlement Department
(Excise Department)

Anundar=*Pinus longifolia*

Babul=*Acacia arabica*

Ban oak=*Quercus incana*

Bar land=Land watered by rain

Beega (Bigha)= $\frac{5}{8}$ acre

Beega (Bigha)= $\frac{1}{3}$ acre (Bengal)

Belas=Alluvial land thrown up by river (waste land or jungle)

Ber=*Zizyphus jujuba*

Betla=Coppice

Biar=Blue pine (*Pinus excelsa*)

Bibla=Biba (?)=*Semecarpus Anacardium*

Borel=1.16 inches

Brinjarah=Cattleman

Candy= $15\frac{3}{4}$ cubic feet

Carcoons=Clerk

Catechu=*Acacia Catechu*

Chapprassi=Orderly or messenger

Chaukidar=Watchman

Chinar=*Platanus orientalis*

Chir=*Pinus longifolia*

Choung=Stream

Chowkeydar (Chaukidar)=Watchman

Cirrus or Siris=*Albizia Lebek*

Dâk runner=Postman

Dammar=Resin of sâl tree

Daman=*Grewia tilioefolia*

Darogha=Sub-inspector of police ; Chief police officer of a village

Dhák=*Butea frondosa*

Dhya=Shifting cultivation (Central Provinces)

Duffadar=Native police officer

Dullee=Shifting cultivation (a form of) ; Dalhi (Marathi)=Arable
land or acclivities, inaccessible to the plough

Enan land=Inam land=Rent-free land

Fanam=A silver coin of the Karnatic; the fanam of the Tamil race (not now current)=1 anna 3 pies.

Gall=Ravine carrying a timber slide

Goung=Forester

Goung-gwai=Forest guard

Gurul (Goral)=*Cemas goral*

Guz=33 inches

Hath=1½ feet

Hedoo=*Adina cordifolia* or *Stephegyne parvifolia*

Huldaree=? *Adina cordifolia*

Inamadar=A holder of a rent-free grant of land

Jaghir=Land grant

Jagur (Jagir)=A free grant of land with its revenues to an individual

Jamum=*Eugenia Jambolana*

Jaur (Jwar)=Indian millet

Jemadar=Indian native commissioned officer

Jhula=A rope bridge in the Himalaya

Jhum=Shifting cultivation (Bengal)

Kadam=*Naulea cadamba*

Kamavisdar=Chief Revenue officer of a district under the Mahratta Government

Kangur=*Pistacea integerrima*

Karkun=A clerk

Katkurries=? Wood cutters

Khair=*Acacia Catechu*

Kharshu oak=*Quercus semecarpifolia*

Kikur=*Acacia arabica*

Kol=24 borels

Kooty kumum=Stump money. Right to sell teak trees at a certain rate per tree (usually Rupee 1)

Kulum=? *Adina cordifolia*

Kumri=Shifting cultivation (Madras)

Kutchna=*Bauhinia racemosa*

Kyoung=A public shed or caravanserai for accommodation of travellers; or a Monastery

Lullow=? *Phyllanthus emblica*

Lumberdar=Village headman

Malik=Village headman

Maund=80 lbs.

Mohal (Mahal)=Quarter of a town or village ; a district.

Mohwa=*Bassia latifolia*

Moru oak=*Quercus dilatata*

Muccadum (Mukkadum)=Headman of a village or foreman of a labour gang

Mumlutdar (Manlatdar)=Officer in charge of local Revenue charge

Munshi=Clerk

Naka=Toll station

Nakhtar=Pines (Afghan)

Natthat=Seasoned timber

Nim=*Melia indica*

Padauk (Burma)=*Pterocarpus macrocarpus*

Padauk=*Pterocarpus dalbergioides*

Paharee (Pahari)=Hill man

Palmyrah=*Borassus flabelliformis*

Parwana=Order ; Imperial writ

Peepul=*Ficus religiosa*

Peon=Orderly or messenger

Pergannah=Civil division of a district

Pfut or P'foot (Phut)=The musk melon, or a cucumber run to seed and bursting when ripe

Pulahi=*Acacia modesta*

Pullari=A tax on pasture lands or on a fishery

Pullus=? *Populus ciliata*

Pun=The silver fir

Punga=*Pongamia glabra*

Putwaree (Patwari)=Village accountant ; village registrar

Pyinkado=*Xylia dolabriformis*

Rukh=Waste land (Punjab)

Ryot=Peasant

Sambhar=*Cervus unicolor*

Sangla=Bridge in Himalaya

Sanud (Sanad)=Title deed ; deed

Sayer=Transit duties levied on goods passing from one district to another

Seer=2 lbs.

Shewun=*Gmelina arborea*

Simul=*Bombax malabaricum*

Siris=*Albizzia Lebbek*

Sirissa or Siris=*Albizzia Lebbek*

Sissoo or Sissu=*Dalbergia Sissoo*

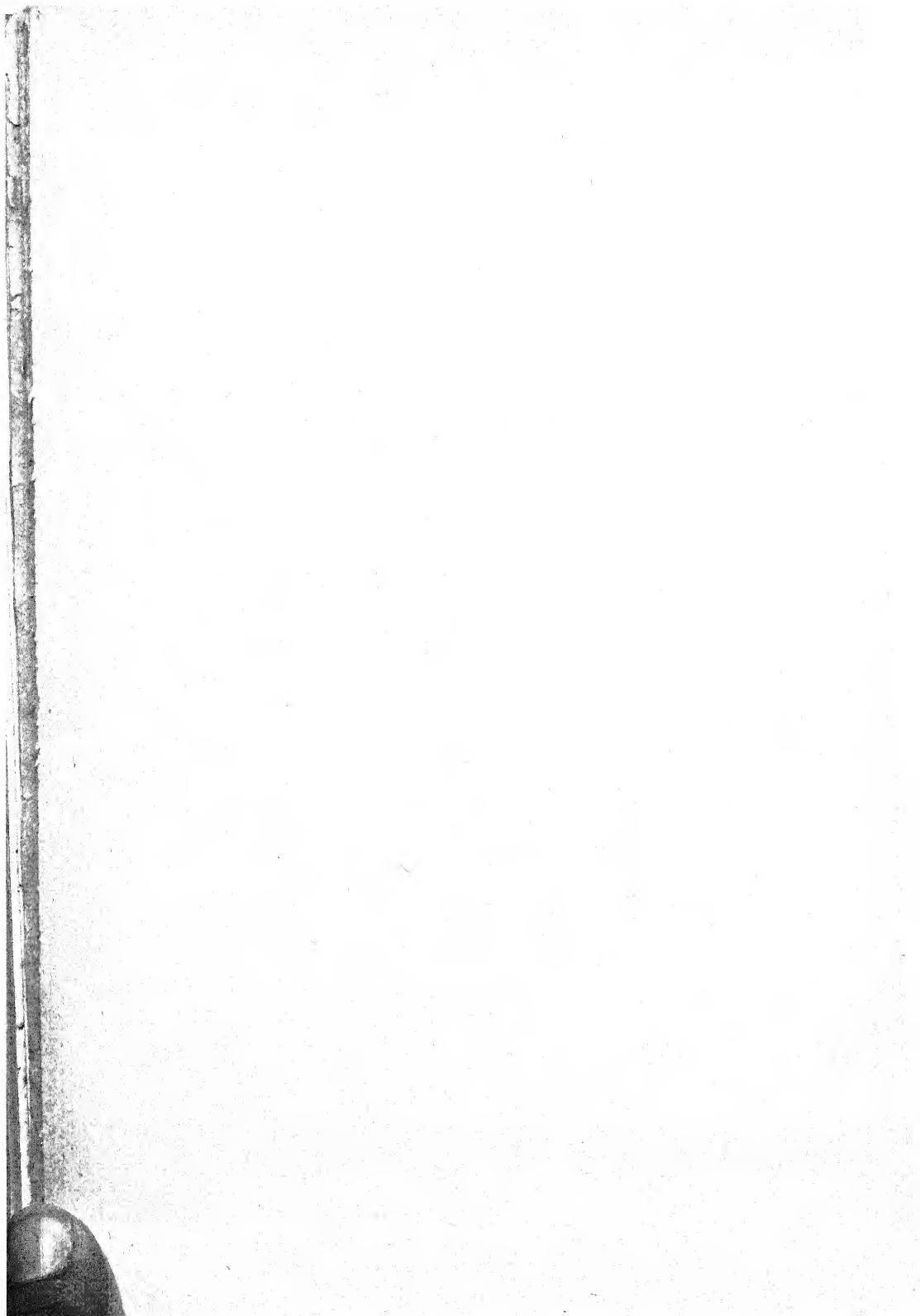
Sudder Station=The chief station of a district

- Tahseel=A local Revenue charge
Tahsildar=See Tehsildah
Talapat palm=*Corypha umbraculifera*
Talook (taluq)=Tenure
Talookdar (Taluqdar)=A revenue farmer
Tamarind=*Tamarindus indica*
Tangili=Ropes or cords
Tank=Artificial or natural pond, or lake
Taroo=A man supported on an inflated skin who assists in rafting logs
Tehsil (tahsil)=A local Revenue charge
Tehsildah (tehsildar, tahsildar)=Officer in charge of local Revenue charge
Thakoor (Thakur)=Chief or feudal noble
Thanna=Police station
Thannadar=Police inspector
Toon or tun=*Cedrela Toona*
Tope=Clump of trees
Tos=Silver fir
Toungya=Shifting cultivation (Burma)
Tuppedar=A small local Revenue officer or headman, or a subdivision of a pargannah
Tussoos=Twentieth or twenty-fourth part of a gaz

Wag nuddee=Tiger nuddee or tiger nulla

Zayat=A rest-house
Zemindar (Zamindar)=A revenue farmer
Zillah=District

INDEX



INDEX

A

Admiralty, British, and teak timber supplies, 63, 64, 69, 142
 Agency dépôts in Bombay, abolition of, 337, 338
 Agency to procure teak timber supplies, 79, 80, 104, 105
 Akbar and tree planting, 32
 Alexander the Great, expedition of, 19, 30, 445
 Alexander the Great, position of forests in north-west at time of, 30
 Alompra dynasty and the teak forests, 206, 244
 Alompra dynasty in Burma and the Burmese teak forests, 35
 Alpine forest zone, 50
 Anaimalai teak forests, 106, 107, 223
 Anaimalai teak forests, working of, 223-229
 Andamans Forests, 48
 Anderson, Dr., appointed Conservator of Forests, Bengal and Assam, 514
 Arabs and the Indian teak market, 1844, 104
 Arabs and Indian trade, 21, 22
 Aryans, advent of, into India, 18, 29
 Aryans and clearance of the forests, 29
 Assam, no Forest Conservancy in, before 1860, 210
 Assam Forests, 518
 Assam, forest operations in, 514
 Attaran Forests, Brandis' work in, 379
 Attaran teak forests, 130
 Auckland, Lord, on the teak forests of Madras, 89
 Auckland, Lord, on the Tenasserim teak forests, 149

B

Babul plantations, how to form them, 487
 Bannu District, sissoo forest of, 474
 Baspa Valley, forests of, 415

Beddome, Colonel, in the Anaimalais, 229
 Bengal, Anderson appointed Conservator in, 515
 Bengal and Assam, no Forest Conservancy in before 1860, 210
 Bengal and timber supplies about 1849, 201
 Bengal, forest operations in, 514
 Bengal Forests, Brandis' visit to, 514
 Bengal, proposed forest establishment for, 516
 Bhutan, war declared against, 515
 Blackwood a royal tree in Bombay, 78
 Blackwood, value of in Madras, 305
 Board of Revenue, Madras, and teak forests, 72, 77, 80, 83, 85, 99, 106
 Boat-building industry of Indus, 474
 Bombay, Annual Report of Forest Department, 1862-3, 359
 Bombay, Bingham's reorganisation proposals, 330
 Bombay enquiry into teak resources, 78
 Bombay forest tariffs, 122
 Bombay Forests, Colonel Jervis's description of their condition in 1843, 111-115
 Bombay Government suggests appointment of a Conservator and staff for forests, 117
 Bombay, rules for protection of forests, 327
 Bombay, start of Forest Conservancy in, 219, 320
 Brandis and Pearson inspect forests of Central Provinces, 396
 Brandis appointed Inspector-General of Forests, 306
 Brandis appointed Superintendent of Pegu teak forests, 207, 263
 Brandis appointed to charge of Tenasserim and Martaban Forests, 206, 243, 263
 Brandis, *Indian Trees*, 39
 Brandis' work in Burma, 367

Bear River, deodar forests on, 265, 417
 British Association, Report on Tropical Forests, 214-218
 Burma Annual Forest Report, 1864-5: 390
 Burma teak forests, 65
 Bushahr, forests of, 410, 415
 Bushahr Forests, valuation survey, report of, by Brandis, 416

C

Canara, Collector of, on the teak forests, 73, 74, 75, 99, 101, 117, 222
 Canara teak forests, 68, 79, 88, 305
 Central India, condition of, in early part of nineteenth century, 197
 Central Indian Forests unexplored in 1860, 392
 Central Provinces, commencement of forest administration in, 392
 Central Provinces, Annual Forest Report, 1863-4, 403
 Central Provinces, area of forests in, 397
 Central Provinces Forests in 1853, 200
 Central Provinces Forests, aborigines of, 398
 Central Provinces Forests devastated after Mutiny by unrestricted fellings, 394
 Central Provinces, organisation of Forest Department, 393
 Chamba, capital of the State, 270
 Chamba Forests, 270, 426, 434
 Chamba Forests, labour force employed in, 435
 Chamba State, timber supplies from, 272, 426
 Charter of East India Company, 24
 Charter of Indian Forests, 206, 256-260
 Chatter Menon appointed to Nilumbur teak plantations, 96
 Chatter Menon's work at Nilumbur, 304
 Chenab and Ravi Agencies united, 427
 Chenab Timber Agency, 264, 272, 434
 Chenab River, deodar and other forests of, 270, 432
 Chir forests of the Western Himalaya, 507
 Chir forests of the North-West Provinces, first attempt to work them, 507

Cinchona cultivation in Darjiling, 517
 Cleghorn appointed Conservator of Forests, Madras, 219, 301
 Cleghorn and Brandis appointed Commissioners of Forests, 324
 Cleghorn deputed to Punjab, 324, 404
 Cleghorn, on Indian Forests at British Association, 214-218
 Cleghorn, on shifting cultivation in Mysore, 1847: 107, 205
 Cleghorn, Report on establishing Forest Conservancy in Madras, 1856, 230
 Cleghorn's work in Madras, 221, 301
 Climate of India, 11
 Cochin teak forests, 305
 Coimbatore teak forests, 106
 Commissary-General, Bombay, and teal supplies, 78, 79
 Communications in India in 1857, 297
 Conolly authorised to appoint a Sub-Conservator of Forests, 91
 Conolly, Collector of Malabar, 88
 Conolly, suggested leasing teak forests by Government, 88, 89
 Conolly's Rules for Forest Conservancy, 91
 Conolly teak plantations at Nilumbur, 92, 105, 304, 306
 Conservator of Forests appointed in Madras, 1806: 64, 70
 Conservatorship in Madras abolished in 1823, 71
 Conservancy of Bombay and Madras Forests, 81
 Court of Directors and enquiries about teak timber, 63, 65, 69
 Court of Directors and the forestry question in Madras and Bombay, 86, 90
 Court of Directors on Tenasserim Forests, 168
 Court of Directors on the Licence system in the Tenasserim teak forests, 185, 188

D

Dalhousie, Lord, Memorandum on Forest Policy, 1855, 206, 256-260
 Dehra Dun (Deyra Doon), sal and sissoo forests of, 1825, 195
 Denudation of forests, effects of, on climate, 325
 Deodar, 51, 264

Deodar, distribution of, 51
 Deodar timber, quality of, from Pangi, 433
 Deodar timber, quality of Indus, Swat, and Kabul Rivers, 471
 Dhya (shifting cultivation) in the Central Provinces, 398
 Drift timber and its salvage, 172, 430
 Dutch in India, the, 22, 23

E

East India Company, disappearance of, 299
 Egypt, trade of ancient, with India, 20
 Elephants, commissariat, employment of, in forests, 159
 Empress of India, Queen Victoria proclaimed, 299
 English, advent of, into India, 23
 English and French in India, 23, 26-28
 English, conquest of India by, 23, 25-28
 Establishments, Forest, for Bengal, 516, 518
 Establishments, Forest, in Bombay, 326, 330, 336
 Evergreen Forest Zone, 41

F

Falconer deputed to inspect the Tenasserim teak forests, 66
 Falconer's recommendations on Tenasserim teak forests, 242
 Falconer's Report on the Tenasserim teak forests, 205, 231
 Falconer's Report on Simla fuel supplies, 284
 Floating of logs, time taken to reach dépôt, 431, 436
 Forest Conservancy in Southern India, 205
 Forest denudation and effect on the climate, 120
 Forest Department placed under Public Works Department, reasons for, 521
 Forest devastation, effects of, on Indian climate and rainfall, 210-214
 Forest policy, absence of British, in early days in India, 37
 Forest policy, first stages in development of a, 61, 205

Forestry Commission of Survey, 1806, 70
 Forestry Department organised in Madras, 303
 Forestry Joint Commission appointed about 1800, 63, 64
 Forests, character and distribution of, 39
 Forests, destruction of, in Bombay, 78
 Forests, influence of waves of invasion and immigration upon the, 29
 Forests, ownership of, on advent of British, 35
 Forests, position of, on advent of British, 34
 Forests regarded as inexhaustible, 61
 Forests, treatment of, in early British times, 35
 Forsyth, Lieutenant, appointed to Central Provinces Forest Department, 395
 Forsyth's descriptions of forests of Central Provinces, 398
 French in India, 23

G

Gamble, *Manual of Indian Timbers*, 39
 Genoese and Indian trade, 22
 Geographical description of India, 3
 Geology of India, 13
 Gibson appointed Conservator of Forests in Bombay, 65, 118, 205, 219
 Gibson appointed "Interim Conservator," Bombay, 117
 Gibson, Report on Bombay Forests, 1840-41: 78, 111, 115
 Gibson's work in Bombay, 220, 305
 Girdling teak trees, 74, 155, 228
 Giri River, forests on the, 406
 Godavari timber forests, 320
 Government of India and rules for protection of forests, 123
 Government of India and the correspondence on teak forests in Madras, 99
 Government of India on the value of the Indian Forests. Despatch of November 1, 1862: 522
 Greeks, advent of, into India, 18
 Gurkhas and the British, first meeting of, 191
 Guthrie appointed Superintendent of Forests in Tenasserim, 66, 176

Guthrie, Report on the Tenasserim Forests, 177
Guzerat teak forests, 68, 108

H

Hamilton (General Douglas) appointed Superintendent of Anaimalai Forests, 229
Hazara, Forest Conservancy in, 455
Hazara Forest Conservancy Rules, 276
Helfer deputed to inspect Tenasserim teak forests, 66, 149
Himalaya, Eastern, forests of, 515
Himalayan Forests (Western), Longden's Report on, 208, 264, 404
Hindu Kush, forests on, 470
Hindustan-Tibet Road, construction of, 272
History of India and influence on forests, early, 17
Hooker, Dr., travels in Eastern Himalaya, 515

I

India, early names of, 18
Indian Mutiny and its results, 295
Indus flotilla demands for fuel, 484
Indus, timber operations on, 464
Iron smelting in Western Himalaya, 271, 272
Ironworks of Western Himalaya and the forestry question, 423

J

Java teak used in shipbuilding in England, 172
Jhelum River, deodar and other forests of, 271, 445
Jhuming (shifting cultivation) in Bengal, 398
Jumna Canal plantations, 201

K

Kabul River, timber operations on, 469
Kaghan, Forests of, 271, 448, 449
Kangra and Kulu, forest revenue of, 422
Kangra, Barnes' Settlement Report of, 266
Kangra, forest rules for, 267

Karens and the teak forests, 174
Kashmir State, the, 208, 209, 264, 270, 425, 441, 445, 453
Khandaish Collectorate Forests, 344
Khundava Forest, burning of, 29
Kumaun, annexation of, 193
Kumaun and Garhwal, Forest Conservancy in, 498
Kumaun and Garhwal hill forests, Webber's forest survey of, 501

L

Lahore District Rukhs and the fuel supplies, 489
Lahore District Rukhs and the fuel supplies, Brandis' and Cleghorn's Memorandum on the, 492
Latter, Captain, appointed Superintendent of the Terasserim teak forests, 186, 206, 232
Licence system in Tenasserim, Government orders on, 180, 187
Licence system in Tenasserim teak forests, appeal by timber contractors against resumption of licences, 180
Lower Provinces, forest operations in, 514

M

Macedonia, clearance of forests from mountains in, 31
Machonochie's Teak Syndicate in Malabar, 68
Madras City fuel supplies, 310
Madras Forests, Memorandum on, by Brandis and Cleghorn, 324
Madras fuel question, conservation of the minor jungles for fuel supplies, 313
Madras, financial results of Forest Conservancy, 307
Madras Government and the Bombay Conservatorship, 119
Madras, start of Forest Conservancy in, 219, 301
Mahomedans, advent of, into India, 20, 21
Mahomedans and forest destruction, 31
Malabar, Collector of, on the teak forests, 73, 83, 88, 99, 101, 122
Malabar teak better than Tenasserim teak, 170
Malabar teak, amounts extracted in 1799, 69

Malabar teak forests, 63, 68, 70, 72, 74, 79, 81, 88, 89, 222, 305
 Michael appointed Superintendent Anaimalai Forests, 229
 Maingy's (Commissioner) proposals on exploiting Tenasserim teak forests, 140
 Mann, Mr. G., Assistant Conservator in Bengal, 517
 McClelland appointed Superintendent of Pegu Forests, 206, 245
 McClelland's Reports on Pegu Forests, 206, 245, 255, 261
 Military Board, Bombay, and the forests, 116, 117
 Military Board, Burma, on forests, 153, 168
 Military Board, Madras, on the teak forest question, 77
 Minor produce, collection of, in Madras, 1843, 103
 Mogul Emperors and planting of *chinay* in Kashmir, 446
 Mogul Empire, decline of, 25
 Moulmein and a shipbuilding yard, 152, 154, 156, 160, 161, 170
 Moulmein, teak trade from, 125, 145, 151, 171, 173, 190
 Murree hill station, 273
 Murree Hills, forests of, 459
 Murree Sanatorium in 1862, 459
 Mysore Forests, Buchanan's note on, in 1800, 107
 Mysore, organisation of a Forest Department in, 323

N

Naini Tal, construction of road up to, 499
 Naini Tal, discovered by Ramsay, 498
 Naini Tal, sanatorium formed at, 498
 Navy and teak timber supplies, 63, 69
 Navy Board (English) and the Tenasserim teak forests, 142
 Navy Board (Indian) and Conservatorship, 65
 Navy Board (Indian) and Malabar teak forests, 72
 Navy (Indian) and supply of large teak timber, 78, 80
 Nilgiri Hills fuel supplies, 307, 310
 Nilumbur, Rajah of, 72, 90
 Nilumbur teak plantations, 92, 105
 Nilumbur teak plantations, Cleg-horn's Report on, 303, 306

Nilumbur teak plantations, Minute on, by Marquis of Tweeddale, 97
 Nilumbur teak timber, 82
 North-West Provinces, absence of Conservancy in, 209
 North-West Provinces and Oudh, forest operations in, 497
 North-West Provinces and timber supplies about 1849, 201
 North-West Provinces, appointment of Forest Surveyors, 501
 North-West Provinces, Brandis visits forests, 500
 North-West Provinces, Commissioners appointed *ex-officio* Conservators of Forests, 497

O

Oak timber, failure of supplies of, for Navy in England, 63, 142
 O'Brien, Captain, appointed to report on the Attaran Forests, 155
 Ootacamund Eucalyptus Plantations, 307
 Ootacamund fuel supply, 307
 Oudh and its Government, 194
 Oudh, annexation of, 1856: 209
 Oudh, forest land in, 1825: 194, 195
 Oudh Forests, appointment of a Conservator of Forests, 510
 Oudh Forests, financial results of first three years' working, 512
 Oudh Forests, First Annual Report, 1862: 510
 Oudh Forests, operations in, 509
 Oudh, position of, in 1816: 193

P

Pabur and Tons Rivers, deodar and other forests of, 406
 Palghaut teak forests, 70, 85
 Panch Mahals ceded by Scindia in 1860, 352
 Panch Mahals Forests, protection of, 352
 Pangi district deodar forests, deodar obtained from, 270, 273, 433, 439
 Pearson, Captain, appointed Conservator of Forests, Central Provinces, 395
 Pearson's tours through Central Provinces forests, 394, 396
 Pegu Forest Rules, 256, 263
 Pegu Forests, felling undersized trees, 253

- Pegu Forests, Government restrictions upon, after their annexation, 244
 Pegu Forests, lease system introduced in, 384
 Pegu Forests, Lord Dalhousie's Minute on management of, 206, 256-260
 Pegu Forests, organisation of, by Brandis, 367
 Pegu Forests, proclaimed Government property, 206, 244
 Pegu Forests, protection and improvement of, 375
 Pegu Forests, Rules for, 373
 Pegu Province, Burma, annexation of, 206, 244
 Pegu teak forests, Reports on, 206, 245, 261
 Peshawar timber supplies, 470
 Petroleum in Burma, Wallich on the, 143
 Plantations in Madras, extension of, 312
 Plantations of teak in Tenasserim, 239, 241
 Plantations on Jumna Canal, 201
 Portuguese in India, the, 22, 23
 Punjab and timber supplies about 1849: 201
 Punjab and Western Himalaya, forest operations in, 264
 Punjab, annexation of, 208
 Punjab at time of Alexander the Great, 30
 Punjab, forest operations in, 404, 448
 Punjab Frontier, description of tracts beyond the, 464
 Punjab Frontier, forest operations in tracts beyond the, 464
 Punjab Frontier, forests of, 448
 Punjab, organisation of Forest Department in, 405
 Punjab Plains, fuel supply of, 483
 Punjab Public Departments and their demands for timber, 1861-64, 442
 Punjab Railway Company's timber supplies, 443

R

- Races, early, of India, 18
 Railway demands of fuel in Punjab, 483, 489
 Rainfall characteristics, 12
 Rajahmundry, Collector of, on the teak forests, 68, 73, 77, 320

- Ramsay, Colonel, institutes Forest Conservancy in Kumaun and Garhwal, 498
 Rangoon Depôt formed, 381
 Rangoon founded in 1775, 244
 Rangoon teak trade, 171, 206, 244
 Ravi River, deodar and other forests on, 270, 423
 Rawal Pindi District, Forest Conservancy work to be undertaken, 463
 Rawal Pindi District, forests of, 461
 Rawal Pindi District, selling price of timber, 462
 Rawal Pindi, Forest Rules for District, 274
 Reafforestation of formerly occupied or cultivated areas, 33
 Ribbentrop, *Forests of India*, 39
 Riparian Forest Zone, 55
 Rukhs of Rawal Pindi District, 461
 Rukhs of the Lahore District and the fuel supply of the railways, 489
 Rungeet, sâl forests of Great, 519

S

- Sâl, 45
 Sâl compared with teak, 403
 Sâl, distribution of, 45
 Sâl forests, destruction of, in Gumsur, 322
 Sâl forests, devastation of, in Upper India, 196, 197
 Sâl forests of Cuttack, 321, 322
 Sâl forests of Ganjam, 322
 Sâl forests of Gumsur, 322, 323
 Sâl forests of Northern Circars, 321
 Sâl forests of Sambalpur, 322
 Sâl forests of Terai (Bengal), 516, 519
 Sâl forests of the Bhabar, North-West Provinces, 508
 Sâl forests of the North-West Provinces, Terai, acquisition of, 193
 Sâl seed, easy germination of, 195
 Sâl timber, Reports asked for on, in Malabar and Travancore, 78
 Salween teak forests, 126
 Saw mill at Madhopur, Punjab, 431
 Sealkote Cantonment, building of, 265
 Secretary of State on Burma Forests, 385
 Secretary of State on Conservancy in Bombay, 328, 349, 357, 359
 Secretary of State on value of the Indian Forests, 1862, 530
 Sewaliks, bamboo forests of, 411
 Shan States and teak supplies, 164

- Shifting cultivation and malaria, 356
 Shifting cultivation (*Kumri*), Madras, 120, 121, 222, 302
 Shifting cultivation prohibited in Bombay, 325
 Sikh War and annexation of the Punjab, 208
 Sikkim (British), introduction of Conservancy into, 515, 516
 Sikkim Forests, 519
 Simla and the formation of plantations, 288
 Simla fuel supplies, 209, 284
 Simla fuel supplies, Cleghorn's Report on, 476
 Simla fuel supplies, Falconer's Report on, 284
 Sind Annual Forest Report, 1864-65, 365
 Sind Forests, 209, 279, 360
 Sind, fuel supply of, 483
 Sind Railway Company, timber demands of, 466
 Sissoo plantation at Madhopur, 431
 Stewart, Dr. J. L., appointed Conservator of Forests in the Punjab, 495
 Surat, Timber Agency at, 108
 Survey, suggested, of teak forests, 1839: 81
 Sutlej River, deodar and other forests of, 271, 409
 Swat River and Valley, timber operations on, 466
- T
- Taxing of timber in Madras, 318
 Tea planting in the Western Himalaya, 505
 Teak, 46, 47
 Teak a "royal" tree in Bombay, 78
 Teak a "royal" tree in Pegu, 206, 244
 Teak declared a "royal" tree in Madras, 64, 70
 Teak declared a "royal" tree in Tenasserim, 65
 Teak, distribution of, 46, 47
 Teak forests and introduction of the licence system, 140, 146, 150, 169, 177, 236
 Teak forests, Burma, 65, 125
 Teak forests, devastation of, in Madras, 71
 Teak natural regeneration, absence of, in Tenasserim Forests, 232, 233
 Teak nurseries in Tenasserim, 164, 167, 169, 232, 241
 Teak plantations in Bombay, formation of, 325
 Teak plantations in Burma, 153
 Teak seed, germination of, 93
 Teak timber, amounts of, brought to Moulmein, April, 1841, to April, 1842: 166
 Teak timber for shipbuilding, 62
 Teak timber, new tariff for, in Madras, 98
 Teak timber tariff in Tenasserim, 145
 Teak timber trade in Madras in 1844: 104, 106
 Teak trade with Moulmein, 125, 145, 151
 Teak trees in the Central Provinces, 402
 Temple appointed Chief Commissioner of newly formed Central Provinces, 392
 Tenasserim Forests, Brandis' work in, 382
 Tenasserim Province ceded to British, 65, 125
 Tenasserim teak forests, 125
 Tenasserim teak forests, devastation of, 151, 153
 Tenasserim teak forests, management of, by Commissioner, 140, 144, 146, 153, 172, 177, 186
 Tenasserim teak forests, Rules for, 141, 155, 163, 165, 167, 173, 176, 187
 Tenasserim teak forests, Wallich's Report on, 126, 143
 Terai sâl forests of Bengal, 516, 519
 The Indus (Upper) and steam fuel, 209, 278
 Tidal Forest Zone, 56
 Timber, demand for, in Bombay, 326
 Tippoo Sahib and teak forests of Southern India, 35, 63, 84
 Tons River, deodar and other forests of, 406
 Toungya (shifting cultivation) in Burma, 376
 Travancore teak forests, 68, 70, 72, 73, 75, 305
 Tree species, distribution of, in India, 39
 Tremenheere appointed Superintendent of Forests in Tenasserim, 66, 153, 174
 Tremenheere's Report on Tenasserim Forests, 157

INDEX

Tropical forests, British Association Report on, 214, 218
 Turks and Indian trade, 22
 Tweeddale, Lord, on the Nilumbur teak plantations, 97

U

Upper India, population of, 196
 Upper India, forests of, 66, 191, 194
 Upper India, Forest Conservancy in, 208

V

Varnish tree, Wallich on the, 128, 167
 Venetians and Indian trade, 22

W

Wallair teak forests, exploitation of, 106
 Wallich deputed to inspect Tenasserim teak forests, 65, 125
 Wallich on formation of teak plantations, 137

Wallich's recommendations on the Tenasserim Forests, 136, 138
 Wallich's third Report, with suggestions relative to Tenasserim teak forests and natural regeneration of teak, 1841, 162
 Wallich visits forests of Upper India, 194
 Waziristan and the Kurram, timber of, 473
 Webber, Mr. T. W., appointed Forest Surveyor in North-West Provinces, 501
 Wellington fuel plantations, 308
 Western nations and Indian trade, 20, 21, 22
 Wood, Captain, appointed Conservator of Forests, Oudh, 511
 Wood oil from Burma, 143

X

Xylia dolabriformis, distribution of, 45, 47

Z

Zone without forests, 57

BY THE SAME AUTHOR

The Diary of a Sportsman Naturalist in India

Profusely illustrated from photographs and sketches by the Author. Demy 8vo. £1 1s. net.

Mr. Stebbing established his reputation as an author and as a "sportsman naturalist" in his books "Stalks in the Himalayas," and "Jungle Byways," while his "At the Serbian Front in Macedonia," and "From Czar to Bolshevik" showed his ability to write books of quite a different kind. In the present volume, Mr. Stebbing returns to his role of "sportsman naturalist," and the many charming little sketches which illustrate the book show that he is also an artist. The book is illustrated as well with several reproductions from excellent photographs. These fine stories of big game hunting and other sport are made vastly more engrossing by reason of Mr. Stebbing's great knowledge of the lives and habits of the various animals and birds concerned.

Punch.—"Dip where you may you will find none of the anecdotes trivial or tiresome. To sportsmen this volume will be extremely welcome."

Daily Chronicle.—"A book with more thrills than many a novel. One is entranced with these tales of jungle adventure and jungle lore."

New Statesman.—"We do not remember a sporting book which gives a better idea of what Indian jungles are to the sportsman than this. Mr. Stebbing has a vast experience of different Indian jungles."

Spectator.—"A most interesting collection of reminiscences of big game shooting."

Truth.—"It is a long time since I read a book of sport of such all-round and thrilling interest."

Paul Mall Gazette.—"The book teems with information and is excellent reading."

John Lane The Bodley Head Ltd., Vigo Street, S.W. 1

Books by Douglas Dewar, F.Z.S., I.C.S.

Bygone Days in India

Illustrated. Demy 8vo. 15s. net.

Indian Birds :

Being a key to the "Common Birds of the Plains of India." Crown 8vo. New Edition. 8s. 6d. net.

Jungle Folk

Indian Natural History Sketches. Demy 8vo. 10s. 6d. net.

Glimpses of Indian Birds

Demy 8vo. 7s. 6d. net.

Birds of the Indian Hills

Crown 8vo. 6s. net.

Globe.—"Mr. Dewar is not only a keen and patient observer, but he is gifted with the descriptive art in high degree, and his vivacious style communicates the characters and habits of birds with unerring fidelity, and infinite spirit."

Daily Chronicle.—"Worthy of all commendation to those who love birds."

Pall Mall Gazette.—"One of the best examples of sound information conveyed in attractive literary form."

John Lane The Bodley Head Ltd., Vigo Street, W. 1

The Civilian's South India

By "CIVILIAN"

Demy 8vo. 12s. 6d. net.

This book of experiences in South India is wonderfully fresh and interesting, and conveys a remarkably full and accurate impression of the country and its people. The author is a Collector, who has had charge of a District for a number of years, and his book has the vigour and attractiveness of a first-hand narrative of a phase of life that is known to the average English reader only through the stereotyped pages of the ordinary Anglo-Indian novelist.

Graphic.—"A remarkably full and accurate impression of the country and its people."

Truth.—"An extremely bright and amusing book. Deliciously satirical, always humorous, never vicious, this is quite the most diverting book of its kind that has appeared for a long while."

Court Journal.—"The author's outlook on life in South India is so unconventional, and with his sense of humour as well as obvious sincerity, should make many desire an early acquaintance with his fascinating work."

Times.—"The author is a true lover of nature."

Topee and Turban, or here and there in India

By LIEUT.-COLONEL H. A. NEWELL, I.A.

With Illustrations from Photographs. Demy 8vo.

£1 1s. net.

Daily News.—"An excellent book. . . . Colonel Newell has a quick eye for things seen, and a happy interest in history that makes the book something more than a motorist guide-book. . . . Fully illustrated with photographs of great interest and variety."

Daily Mail.—"Everyone ought to know more about India, and a pleasant way of informing oneself is offered by Colonel Newell's 'Topee and Turban in India.'

Westminster Gazette.—"In this book Colonel Newell shows that he has been a close student and observer of many things in India and Indian life."

John Lane The Bodley Head Ltd., Vigo Street, W. 1

Companions Feathered, Furred, and Scaled

By C. H. DONALD, F.Z.S., M.B.O.U. Illustrated.
Crown 8vo. 7s. net.

In this book Mr. DONALD, the well-known naturalist, describes the various wild pets acquired by himself and his wife during their jungle-camping trips. They make a varied and interesting collection, for Mr. DONALD has a catholic taste in his animal friendships, and is equally at home with his golden eagles, vultures, cormorants, weavers, and his red flying squirrel tippity. He has illustrated the book himself from his photographs and drawings.

EXTRACTS FROM REVIEWS.

"His book is a bright and humorous account of the habits of his strange friends."—*Daily News*.

"Full of entertaining stories and photographs. A capital book for animal lovers."—*Star*.

"These chatty sketches by a keen and courageous naturalist" *The Times*.

"Many of the incidents related are most amusing, and are very well told."—*Field*.

In Nature's Garden

By C. H. DONALD. Illustrated. Crown 8vo. 7s. net.

Rifle and Romance in the Indian Jungle

Being the record of thirteen years of Indian Jungle Life.
By MAJOR A. I. GLASFURD (*Indian Army*). With numerous illustrations by the author, and reproductions from photographs. Crown 8vo. 12s. 6d. net.

"To the list of books on big game shooting that can be recommended equally to the sportsman and the general reader must be added this truly fascinating work. We have read it through from cover to cover and pronounce it excellent."—*Literary World*.

John Lane The Bodley Head Ltd., Vigo Street, W. 1